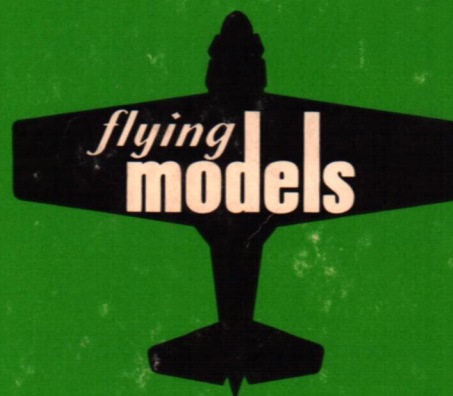


MODEL PLANE BUILDING

FROM 'A' TO 'Z'

\$2.00



★ OVER 230 HANDY HINTS
★ 35 PAGES OF DATA SHEETS

★ 19 SCALE THREE-VIEWS
★ 36 SELECTED AIRFOILS

PLUS
15 RADIO-CONTROL
MODEL PLANS



HAROLD STEVENSON

Introduction:

MODEL PLANE BUILDING
... from 'A' to 'Z'

► FLYING MODELS has for many years set the pace for informative material which has been of help to both beginner and expert. The highly popular "Data Sheets" can be considered one of these pacesetters and many a beginner found it easier to start in this fulfilling hobby because of them. This material also jogged the memories of experts who had drifted away from many usable techniques.

It's the effort of this handbook to compress the maximum of usable information into one handy reference. To do this, we've taken material which has created the greatest interest in modelers over the years and "compartmented" it into this publication. We feel that this material has been refined down to its most usable form.

It is to no amazement that there is a recurring request for material of this nature. The hobby and sport of model plane building is constantly finding new recruits in search of material to get started. Also, many of the oldtimers are seeking sources to replace mate-

from the pages of



MODEL PLANE BUILDING FROM 'A' TO 'Z'

rial and information which was lost or misplaced. Then, too, there is the group that missed out getting the material as originally published because supplies were exhausted by the time of their request.

We feel that this book will prove to be an excellent guide for clubs and schools with projects in model plane building. It should also serve to indicate how broad the field of modeling spreads, its complexities and solutions, its simplicities and pleasures.

The simple gauging of the man-hours that went into drawing all of the lines, lettering all of the panels and plans — not to mention the man-hours of thought that went into producing the Handy Hints — is too formidable to contemplate. What you find here is a condensation of many years of effort by many excellent model builders, designers and artists.

We hope you enjoy this publication and gain many time-saving knacks to make hobbying more pleasant. And, we suggest that you keep close tabs on this edition. It is a limited printing and will prove to be a scarcity as have the 5 previous Handbooks in this series.

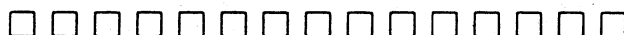
The Editors

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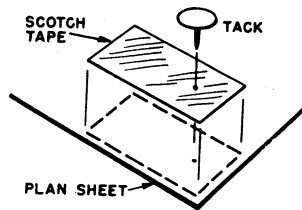
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We would like to dedicate this publication to two staunch modelers whose designs and efforts have done so much for model aviation — Paul Del Gatto and S. Calhoun Smith. Both have passed from the modeling scene but they have left their marks for the many that follow. Much of what you find in these pages was created and drawn by them and we feel that MODEL PLANE BUILDING FROM 'A' TO 'Z' is a fitting tribute.

PLAN SAVER

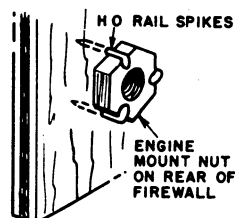
Kit plans are usually folded tightly or rolled as they come from the box. In order to smooth them out flat, to put them down on the building board, try



this trick: Put a small square of Scotch tape at each corner (and several along the edges if the plan is big). The tape reinforces the paper so that it will not tear when thumb tacks are inserted and the paper is stretched smooth. WARREN McCANDLESS, Toledo, O.

NUT HOLDER

When mounting blind nuts on the rear of a firewall, for radial engine attachment, try holding the nuts in place with HO rail spikes. Several spikes



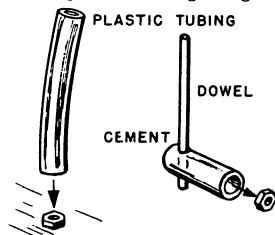
and liberal coats of cement will anchor the nuts firmly. Works well on smaller engines but 19's and 29's vibrate too much. TOM HUME, Monrovia, Calif.

Substitute Wrench

Ever tried to get a nut onto an engine bolt down inside a cowling or around a tight corner? This hint may help you next time you come across this problem:

Take a few inches of larger diameter plastic tubing and push the nut into its end. If the nut won't fit, enlarge the hole in the tubing with a knife or apply heat from a match for a moment. Put the nut on a table top and push the tube down onto it.

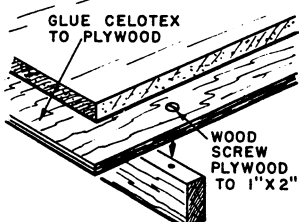
Getting the nut started is usually the hardest part. The tubing will get into



those tight places to enable you to do this. Final tightening will have to be done with a small open end wrench or something similar.—W. A. POLLARD, Cheshire, England.

Building Board

A good workboard for building models can be made from a piece of Celotex or similar wallboard. This is



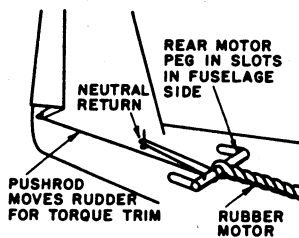
fairly smooth and will take pins much easier than most hardwoods.

To retain a good flat surface and



TORQUE COMPENSATOR

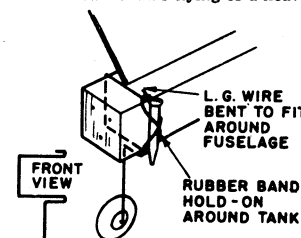
Adequate rudder trim, to counteract torque on a rubber model, usually results in too tight a glide turn when power is spent. To correct this, make this automatic trim control: The rear motor peg is fitted in slots and at-



tached to the rudder horn. As tension on rubber motor becomes less, the spring or rubber-loaded rudder returns to neutral. Experiment to find the proper rudder trim settings for power on and power off conditions. CECIL P. LEWIS, Beaufort, N. C.

EASY GEAR-MOUNT

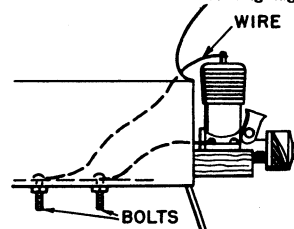
This is one especially suited to 1/4 A models with slim noses. Instead of mounting the landing gear on firewall, bend it to fit around the fuselage and clamp it with rubber bands. Eye-dropper tanks can also be held in place under the bands. Small blocks will hold the gear in position. The gear can be removed for VTO flying or a heavy-



ier wheel, on an interchangeable gear, can be used for windy weather flying. HOWARD G. EVANSON, Minneapolis, Minn.

BOOSTER ATTACHMENT

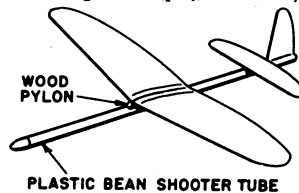
If your booster-leads tangle with the propeller when you are starting that engine, try moving the attachment point back out of the way, as shown here. Mount two bolts at some convenient spot and run wires to the engine. One wire should be ground on the motor at the crankcase mounting lug,



the other connects to the glow-plug top. A slip-on connector could also be used at the glow plug, with wires leading to bolts for the alligator-clip booster connection. A two-prong plug and socket could be fitted into the fuselage side. DANNY RHOADS, Fremont, Ind.

QUICKIE FUSELAGE

A plastic bean shooter tube, obtainable in 5&10's, makes a good H/L glider fuselage. Add a plug in the nose, a

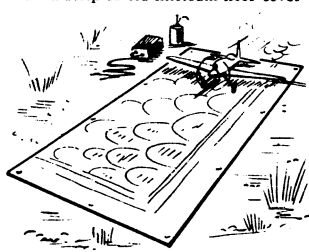


prop and rubber to make simple rubber model. Plastic cement may have to be used for adhesion to the plastic tube. Reinforce wing and tail joints with gauze or paper. HARRY MEEKINS, North East, Md.

prevent warps, back up the Celotex with a sheet of plywood and a couple of 1" x 2" stiffeners. Glue or nail the Celotex to the plywood. Make the board a convenient size, such as 24" x 36".—C. E. NASH, Carlsbad, N. Mex.

Yo-Yo Runway

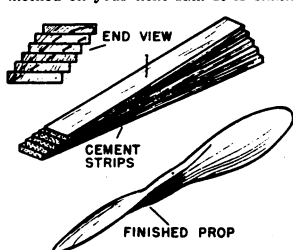
Control-line flying sites are not always as smooth and dust-free as most modelers would like. If this is your trouble, a portable runway can be made from a strip of old linoleum floor cover-



ing. Hold the corners down with spikes. A 3' x 10' linoleum strip should be large enough for most flying. Try this on your local rock-pile or dust bowl!—DON JONES, Tarzan, Texas

Laminated Rubber Props

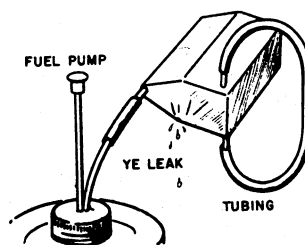
When a prop block or blank of the desired size is unobtainable, try this method on your next fan. It is similar



to that used for full-scale light-plane propellers. Cut strips of 1/4" sheet balsa about 1/2" wide to the desired length. Cement them together as shown, spreading slightly fan-like. Carve and sand to shape. Vary the thickness and width of the strips according to the size of the propeller needed. Cut the strips extra wide so that there will be plenty of wood to work with. Cement lines will aid in proper contouring.—JAMES HARRIS, Chicago, Ill.

Tank Testing

Most modelers go about testing a fuel tank by plugging up the two breather tubes, attaching a football pump to the filler tube, putting the whole works underneath six inches of ice cold water, and then pushing up and down on the football pump and looking for air bubbles. This is the old reliable method, and it always works, but it is not so handy when a leak develops on the flying field. So try this method of finding a leak in a fuel tank: Take some excess neoprene tubing, about 4" or so, and attach one end to a breather tube on the tank that is to be



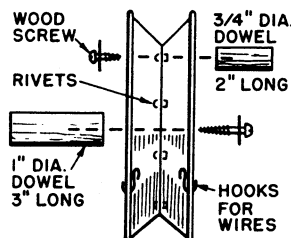
tested, and then attach the other end of the tubing to the remaining breather tube. Now take the neoprene tubing on the end of the fuel pump nozzle and attach this to the filler tube on the tank. Start pumping until the tank is full of fuel—then keep right on pumping.

If there is a leak, you will notice fuel oozing out of the leak, along with a lot of air bubbles. If there is no leak

in the tank, there is not enough pressure generated in most fuel pumps to cause any disastrous results.—KENNETH SCOTT, Beloit, Wisc.

Line Reel

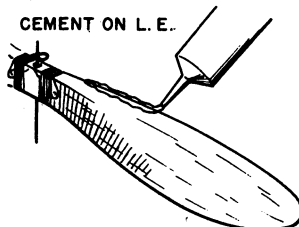
An inexpensive control-line storage reel can be made from two 5" aluminum pie pans. Rivet or bolt them bottom to



bottom, and fit with a handle and crank. Drill holes in the rim to hook on the line ends.—ROBERT MUNDY, Upper Sandusky, Ohio.

Rubber-Model Prop Saver

Balsa rubber-model propellers take a beating along the leading edges. Try this kink to make the props more durable: Coat the leading edges with a

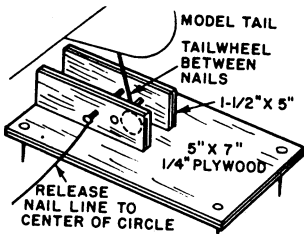


couple of layers of cement. On large props, a strip of silk or paper can also be added. Set in cement.—LEROY WILLIAMS, Perryville, Ark.

HINTS

PLYWOOD STOOGIE

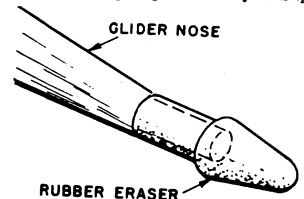
Here is a handy helper that can be made from scrap plywood or thin lumber. The base has two pieces of wood nailed in place vertically with space between them for the tailskid and tail-wheel of a model. One nail is fixed, the



other one movable to release skid. Fish-line to center of circle pulls the release nail. One release nail may be used if the skid is bent with an eye in end. RAY-BURN WILTON, Mt. Brydges, Ont.

NOSE GUARD

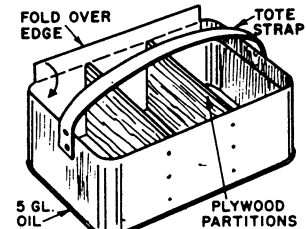
H/L glider noses really take a beating and soon get split and frayed. Slip



a rubber pencil eraser over the nose and let the rubber do the bouncing.

ACCESSORY KIT

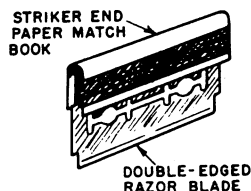
If you need a kit to carry tools, props, fuel and batteries to the flying field, here is an inexpensive idea: Obtain a 5 gallon oil can and cut off the bottom, leaving the sides 6" to 9" high. Cut each



corner down about 1" and then fold edge over inwards so there will be no exposed sharp edges. Rivet or bolt a belt or strap across top for a carrying handle. Put in plywood partitions as required. WESTLEY GLISSON, Titusville, Fla.

FINGER SAVER

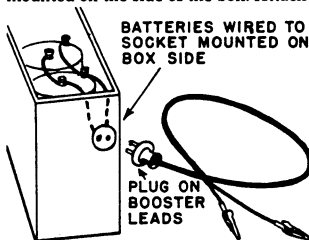
When using double-edged razor blades for cutting balsa, protect your fingers with this handy wrinkle: Tear off the striker end of a paper match book and then slide razor blade between the match cardboard and up against



the staple. This will avoid quite a few nicks in the fingers. CHARLES KELLOGG, JR., West Newton, Mass.

Plug-In Booster Leads

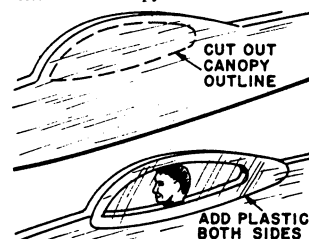
If you use a field box to keep your fuel, props and booster batteries handy to your model, this trick will help you. Mount your booster batteries inside the box and run leads to a socket mounted on the side of the box. Attach



a plug to one end of your booster leads and alligator or Kwik-clip to the other end. Booster leads can then be plugged in to use, and unplugged, rolled up, and put in box when not in use, thus preventing possibility of shorting out. If available use small plug and socket of the type used for R/C models. MURRAY HEARD, Lima, Peru.

Profile Cockpit Canopy

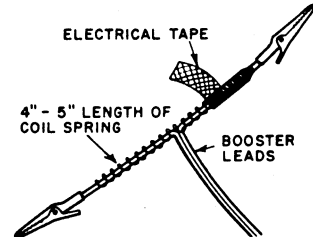
To help dress up your solid plank profile model, make a cockpit canopy as shown. Cut out the center of the solid wood canopy and then cement



clear plastic on each side. Put in a silhouette pilot's head if desired. ARTIE WIESE, Bay Shore, N. Y.

NO-SHORT BOOSTER LEADS

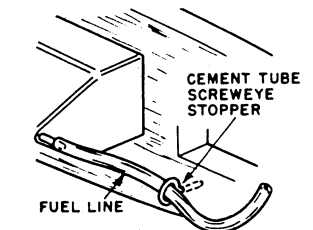
Booster battery leads with alligator clip ends often touch when dropped after starting an engine. To keep the clips from touching, shorting and draining the battery, twist about a 4" or 5"



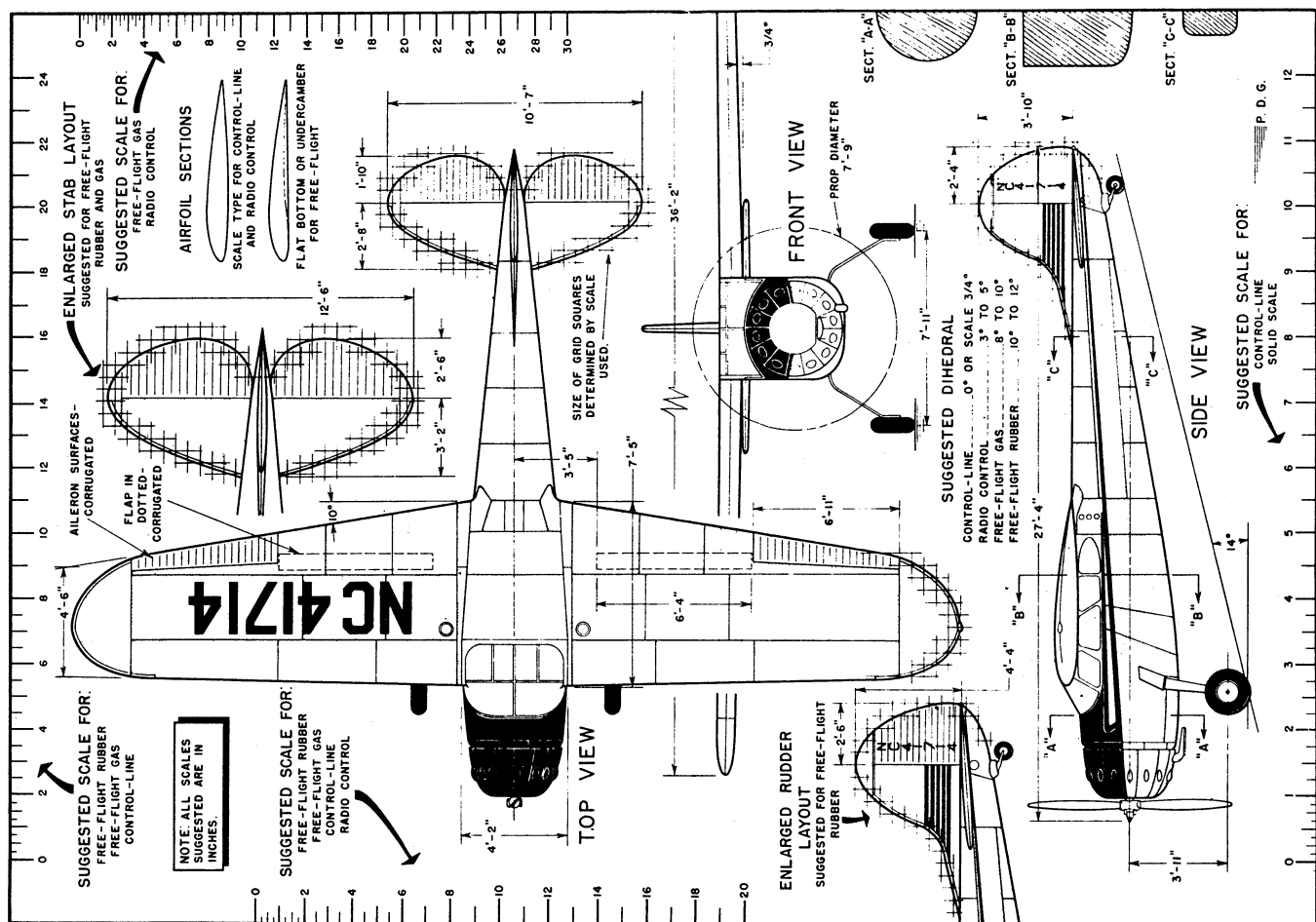
length of 1/4" diameter coil spring onto the leads and wrap with electrical tape. Spring will keep clips apart when not in use, but is flexible enough so that clips can be put on the engine easily. BILLY CENTNER, Westport, Conn.

FUEL-LINE GUIDE

Screw-eye stoppers from cement tubes can be used to hold down floppy fuel lines leading from tank to engine on profile models. Drill a small pilot hole in fuselage side at the desired



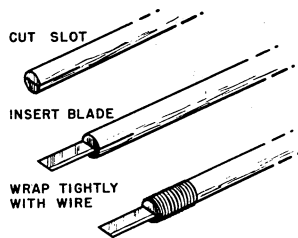
location. Screw eye into place, and thread the fuel line through the eye. It will keep the fuel line away from engine heat. WAYNE BROWN, Drumheller, Alberta, Canada.



HINTS

Modeler's Knife

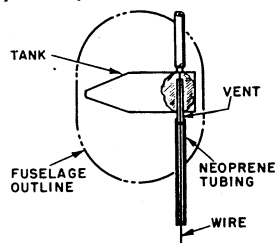
If you don't have a standard commercial knife set, here is a handy substitute: Cut a slot in a length of $\frac{1}{4}$ " or $\frac{3}{8}$ " diameter dowel to fit a standard knife blade or Injector razor blade. In-



sert blade in slot and wrap tightly with copper wire to hold blade firmly. Rewrap when blade is replaced.—E. WOODSON, JR., Roxbury, Mass.

Plumber's Helper

When neoprene tubing on vent pipes pulls away from short vents on models

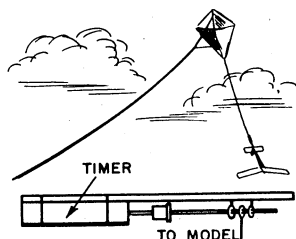


where the tank is well buried in the fuselage structure, simply run a piece of wire into the vent and slide the neoprene tubing over it.—C. BERGSETH, Seattle, Wash.

Hi-Fly Glide Test

Ever wished for some method of glide-testing your models at a higher altitude, to determine necessary adjustments, before trying powered flight? The kite-launch system really works well. The kite has a small Elmic timer tied on its tail. The model's tailskid is hooked onto the timer, the timer is set for about one minute, and the kite and model are sent aloft. When the timer releases the model, it can make a prolonged glide down, giving the builder plenty of time to watch glide performance.

Tests have shown that an ordinary 3' kite will lift a light 30" $\frac{1}{2}$ A model in a 14 m.p.h. wind. But this amount of wind is undesirable for most testing, so you need a larger kite to lift more in less wind. Remember that increasing the size twice increases the area by four. A 55" newspaper-covered kite



towed a 1/2 A free-flight model in a 9 m.p.h. wind.

When flying in a strong wind, use a long thin tail. In a light wind, when no tail is needed, tie the timer to the end of a piece of string running at least 10' from the kite, to prevent the model from swinging and upsetting the kite.

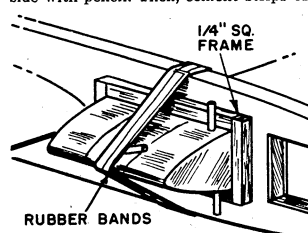
Flying procedure goes like this: Raise kite, tie down end of cord, then place string under arm and walk kite nearly to earth. Attach model, release kite, move downwind, and wait for your model.

Even if you don't use this wrinkle for glide-testing, it's great sport for flying hand-launched gliders or small towliners. — DOMINIC D'ONOFRIO, Detroit, Mich.

Tank Anchor

Here's a solderless fuel-tank mounting for your profile trainer, stunt or combat ship:

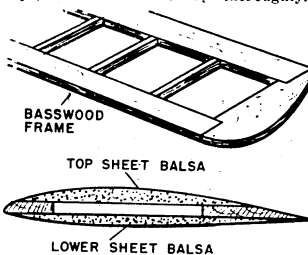
Place the tank in position on the side of the nose and mark its outline on the side with pencil. Then, cement strips of



$\frac{1}{4}$ " square wood around the outline, as shown, to form a shallow slot for the tank side. Slip a few husky rubber bands around the fuel tank and fuselage to hold the tank in place.—PAUL GERHART, Tracy, Calif.

Speed Wings

Strong, easily built wings for your speed job can be turned out using the procedure shown. Lay out basswood leading and trailing edges, add ribs and tips, and let cement dry thoroughly.

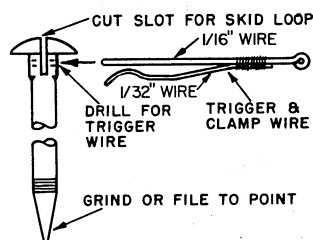


Add sheet balsa top and bottom sheets and carve to airfoil shape. This makes a durable lightweight wing that can be carved to sharp edges where needed.—EVERETT L. BARLOW, Albuquerque, N. Mex.

Simple Stooge

Here's a simple stooge well suited to grass or dirt controline flying sites:

A $\frac{1}{4}$ " diameter carriage bolt, about 6" long, is slotted and drilled at the head in the manner shown. Then, a trigger is made, using $1/16$ " diameter wire for the top part and $1/32$ " diameter wire for the clamp part. Bind the two



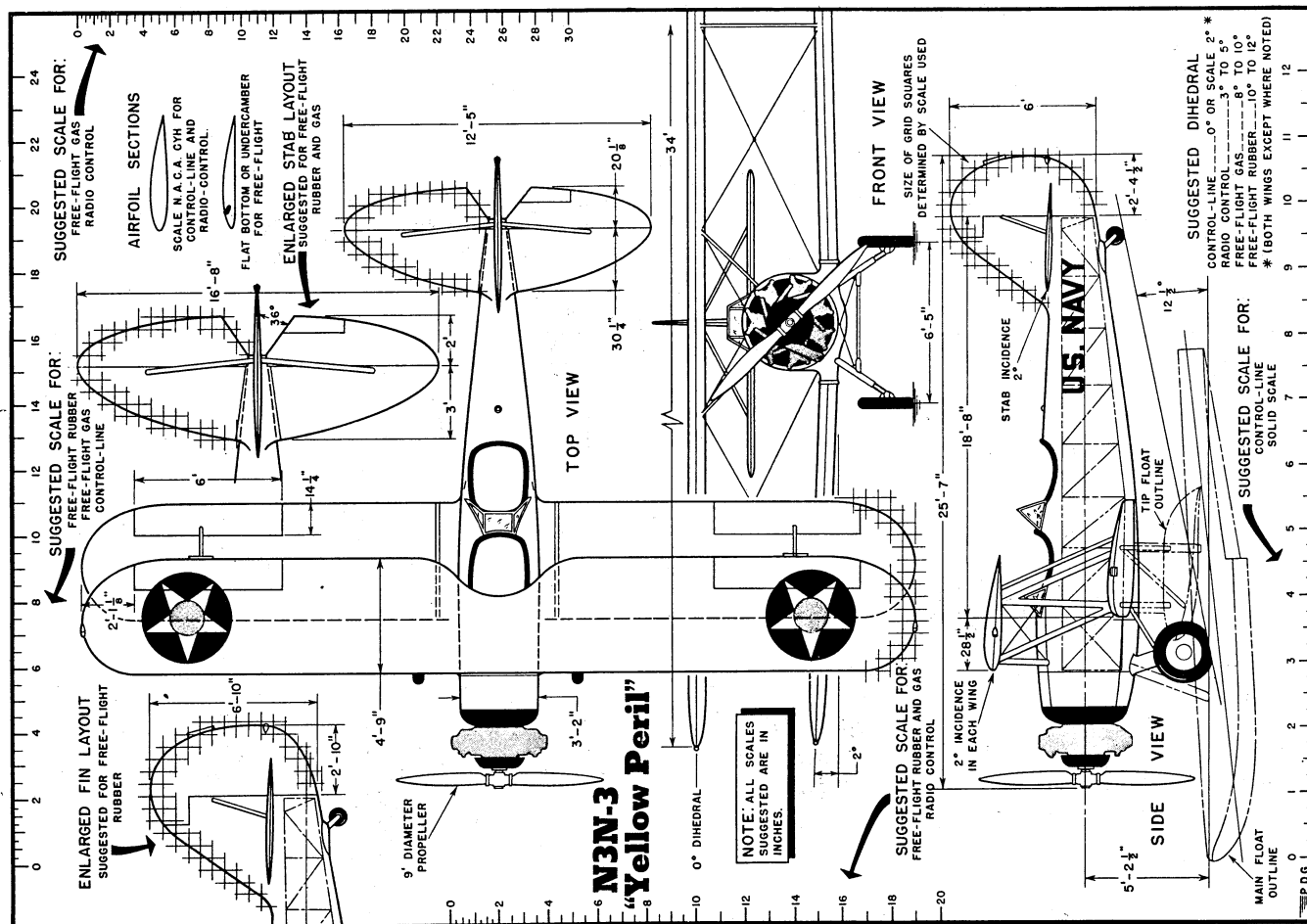
wires together with soft wire and solder. The end of the bolt is ground or filed to a point.

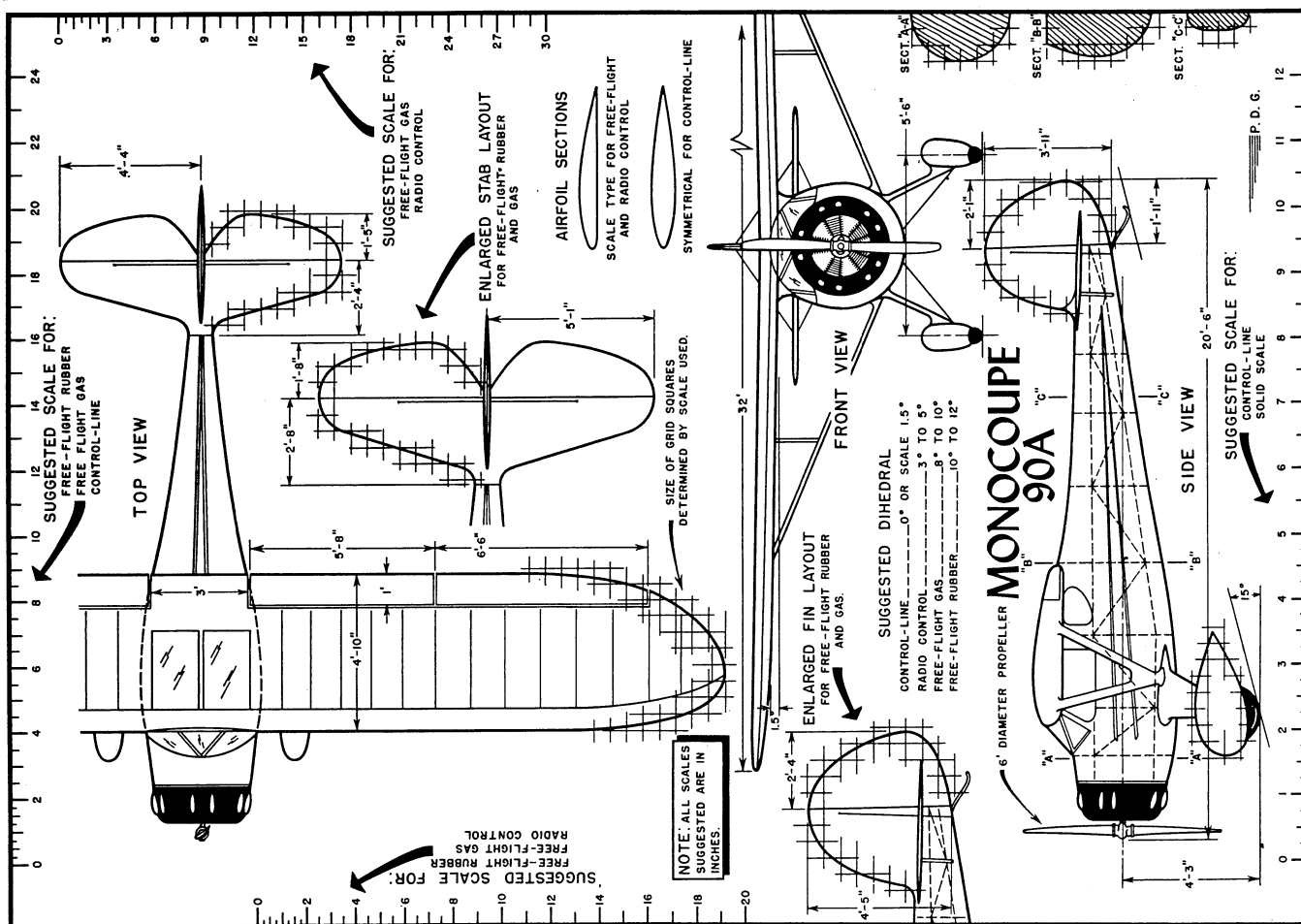
The operation goes like this: The bolt is pushed into the ground. The tailskid loop on your model is placed in the slot and the trigger wire is passed through the bolt head and loop, with the clamp wire bent around one side of the bolt to hold the trigger in place.

A string extending to the center of the flying circle is tied to the loop at the end of the trigger. Then, to fly, the string is yanked, the trigger wire pulls out of the hole in the bolt, the tailskid is released, and the plane takes off.—**BILL RINCK**, Springfield, Mo.

Cement-Proofing Plans

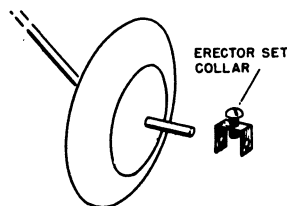
Being caught short without any waxed paper when some important building is in progress need not make things difficult. Lay the plans out on your workboard and get an ordinary candle. Light it and, holding it on its side, allow the wax to melt and drip off onto the plan. Drip only onto the junctions of the structure pieces, where cement is liable to overflow. While still soft, spread the wax puddles out with your finger or wait until it cools and then scrape the top flat with a knife, so that the surface will be smooth to build over.—M. KRIM, Bronx, N. Y.





Wheel Retainers

Robbing the kid brother's Erector set may stir up a family fight, but some of the small hardware comes in handy in

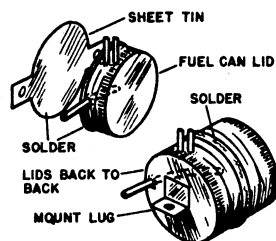


the model workshop. The U-shaped shaft collars with setscrews, for example, can be used for wheel retainers. Simply tighten the setscrew down on the axle end.—DAVID ARTHUR, Jackson, Ohio.

Baby Engine Tanks

Small fuel tanks for Class 1/2A engines can be made easily from bottle or fuel-can caps.

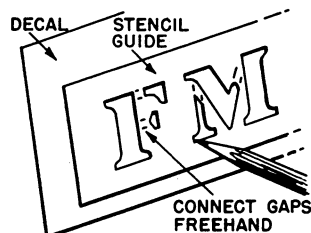
First remove the paper liner, then



cut a sheet of tin slightly larger than the lid size and solder it directly to the bead on the lid. Or, join two lids at the bead with open ends facing each other. Solder the fuel and filler lines into the caps before joining. Solder on lugs as needed.—DON MANSMANN, Pittsburgh, Pa.

Decal Patterns

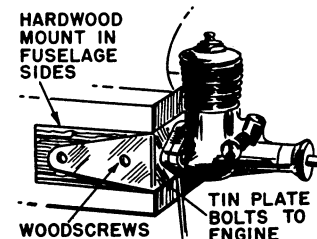
A good stencil guide for the modeler who likes to make his own numeral and letter decals can be found in any five and ten cent store. Lay the guide over a decal sheet and trace the outline



Then, cut out the decal and apply it in the usual manner. Or: dark colored decal paper it is easier to transfer the outline to the backing paper (but remember to flip the stencil guide!)—ROBERT AVERY, Watervliet, N.Y.

Strap Engine-Mount

Radial mounting of small 1/2A engines can be a fussy job on some models. Try this system for an easily accessible outside mount: Your model fuselage should have hardwood bearers



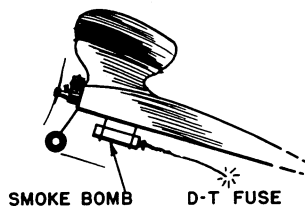
or plates built into the sides at the nose. The engine is bolted to a strip of heavy tin-can stock, thin sheet dural or steel, bent around the nose and sides. Woodscrews hold the strap to

the hardwood. Thrust adjustments can be made by enlarging the holes in the strap for the wood screws and sliding the strap to adjust.—JOHN KIDWELL, Dinuba, Calif.

Free-Flight Finder

If you are flying where conditions are hilly, with tall grass, or where the corn is tall, you may be able to use this idea for locating that wandering free-flight model:

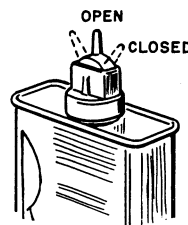
Attach a smoke bomb (type used in control-line) to your model with some dethermalizer fuze attached to the bomb fuze. Use as long a D-T fuze as



needed. Then, when the model gets down and the bomb fires off, the smoke will be visible for a good distance. (Check with your hobby dealer to see whether local laws permit you to use smoke bombs).—JIM JANSEN, Manitowoc, Wisconsin.

Primer Can

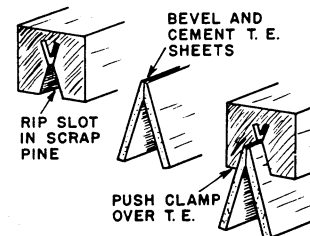
The new Ronson lighter-fuel can with the switch spout makes an inex-



pensive, pocket-size, fuel and primer can for 1/2A tanks. The switch spout is open when straight up and closed when moved to either side. Made of fuel-proof plastic, it can be pried off with a screwdriver for refilling the can with fuel.—GEORGE WEHRFRITZ, Jacksonville, Fla.

Trailing Edge Clamp

A sheet trailing edge presents a cementing problem since it is difficult to apply pressure to the joint along its entire length. The clamp shown will solve the problem and insure smooth sheet trailing edge construction. Rip slots in a length of scrap pine with a table saw at the approximate angle of the trailing edge. Taper the rear edges



of trailing edge sheets, cement together, and add the clamp tapping it lightly into place. Cemented trailing edge sheets can be put on the ribs now or let dry. Wax the inside edges of clamp to prevent excess cement sticking to it. VERNON H. VAN DIVER JR., Woolford, Md.

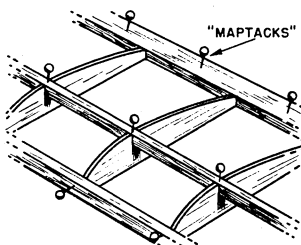
Jetex Fun

A real jet-powered bomb can be made from a Jim Walker 10c glider, Interceptor or Hornet. Mount a Jetex 35 or 50 engine under the balance point or on the fuselage top if desirable. Cement tail pieces permanently in place so the jet blast won't dislodge them. Then let 'er rip. DOUGLAS HILL, Denver, Colo.

HINTS

Needles and Pins

This is not a commercial for the map-tack manufacturers, but did you know that map-tacks can serve the model builder equally as well as chart watch-



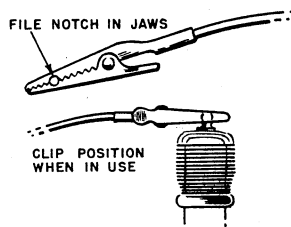
ers? Map-tacks have a round head (about 3/16" diameter) and are made of steel, with very sharp points. They come in various sizes and colors and are ideally suited for model work. They can be easily handled, and their heads won't fill your finger full of holes, like ordinary straight pins. Map-tacks are available in most book and stationery stores. Try them when building your next model!—BOB BAKER, Fond du Lac, Wis.

Lead Salvage

Rubber and towline model builders should welcome this suggestion: Instead of cutting up good solder for ballast, try reclaiming the lead in your used cement tubes. When the tube is used up, flatten it with a hammer and roll it tightly. Cut off the clip and spout ends to make a smooth roll. These weights can be trimmed with shears or a knife to the required size.—GLENN GESELL, Worcester, Mass.

Glow-Plug Clips

If your booster clips keep sliding off your glow-plug top and shorting out against the cylinder head, simply file a

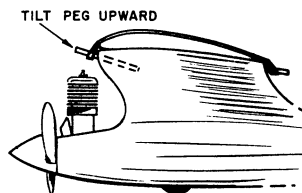


notch in the jaws of the clip, large enough to fit over the glow-plug top, as illustrated.—KROME BOWEN, Gainesville, Florida.

Pop-Off Wing Tie-Down

Usually modellers can think of many ways for holding the wings tightly onto a free-flight model. But what about those wing-low landings and spirals?

The idea shown here will get the wing off the fuselage with a minimum of damage. Simply cock the front tie-down dowel up slightly so that the rub-



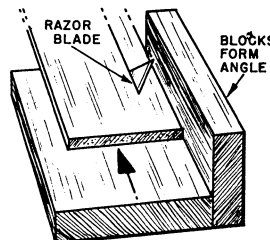
ber will slide forward and off with ease. Tension will hold the rubber in place under normal flying conditions.—GORDON WARD, York, Pa.

Balsa Stripper

An easily constructed stripper can be made as shown. Cement two blocks or thick sheets together to form an angle. Imbed a razor blade in the lower block at the desired distance from the vertical block. Allow only a corner of the razor to extend upward and have it slant into the block.

Use heavy blades, such as an Injector, or single-edged blades with the backs off. A couple of nails driven through the side of the block behind the blade will hold it firmly in place.

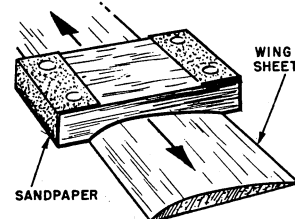
To use the stripper, simply push sheet stock against the blade, with the



edge snug against the vertical block. Hold the sheet flat on the lower block for a square cut. Mind those fingers, too!—JAMES SCOTT, Quebec, Canada

Forming Sheet Wings

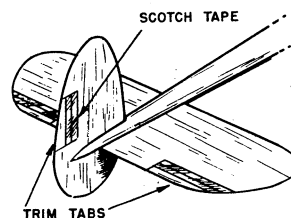
Getting a constant airfoil section on solid model or glider wings has always been a problem, but this sanding block will do a neat job. Carve the block to the desired airfoil shape and then sand



away. A little rough carving on the wing will shorten the labor.—LAWRENCE RODRIGUE, Kamloops, B. C.

Glider Adjustments

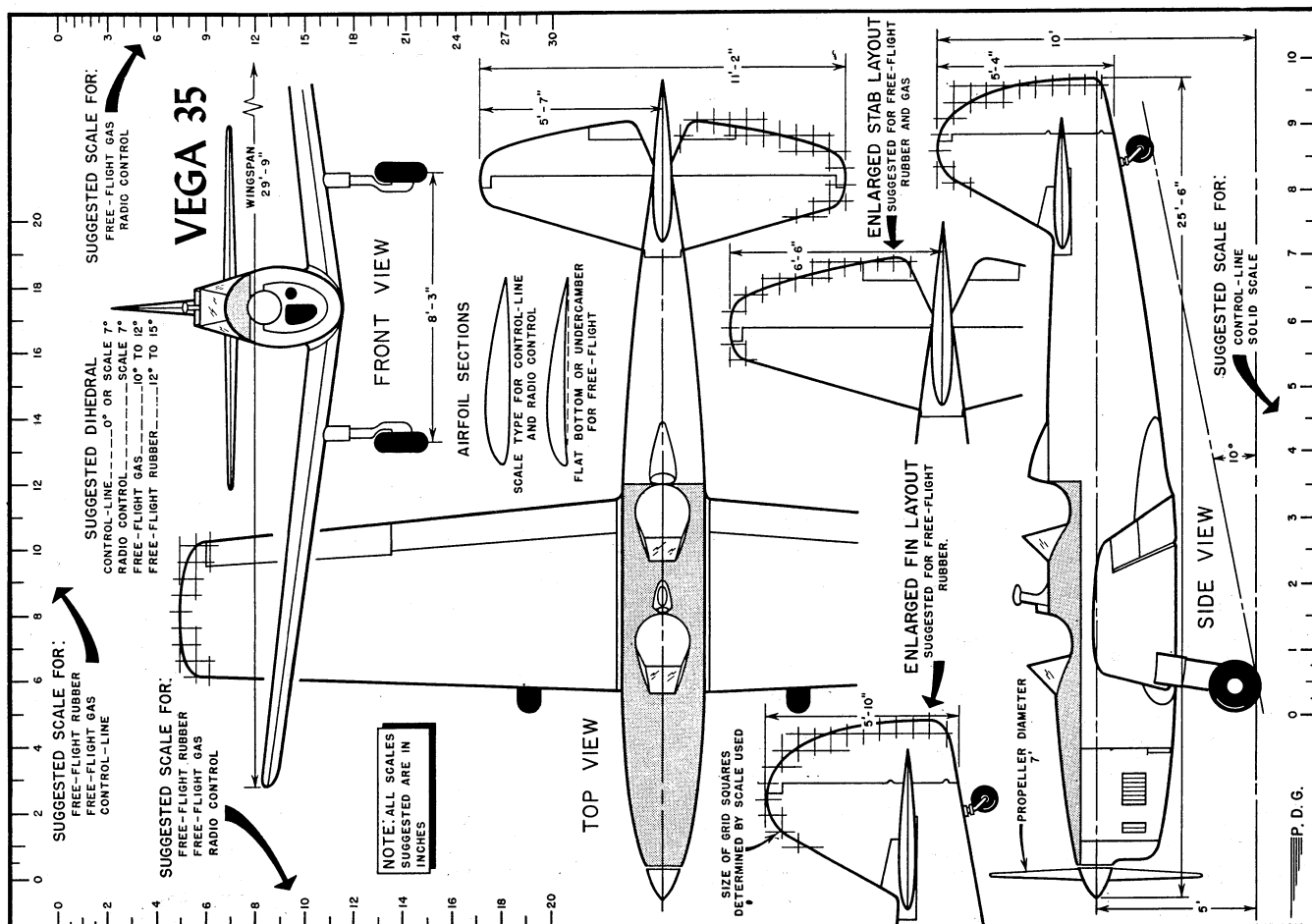
Fine adjustments on hand-launched gliders can be made with these trim tabs. Simply cut out portions of the control surface to form the tabs and hold in place with a length of Scotch tape. Make good clean cuts so that the

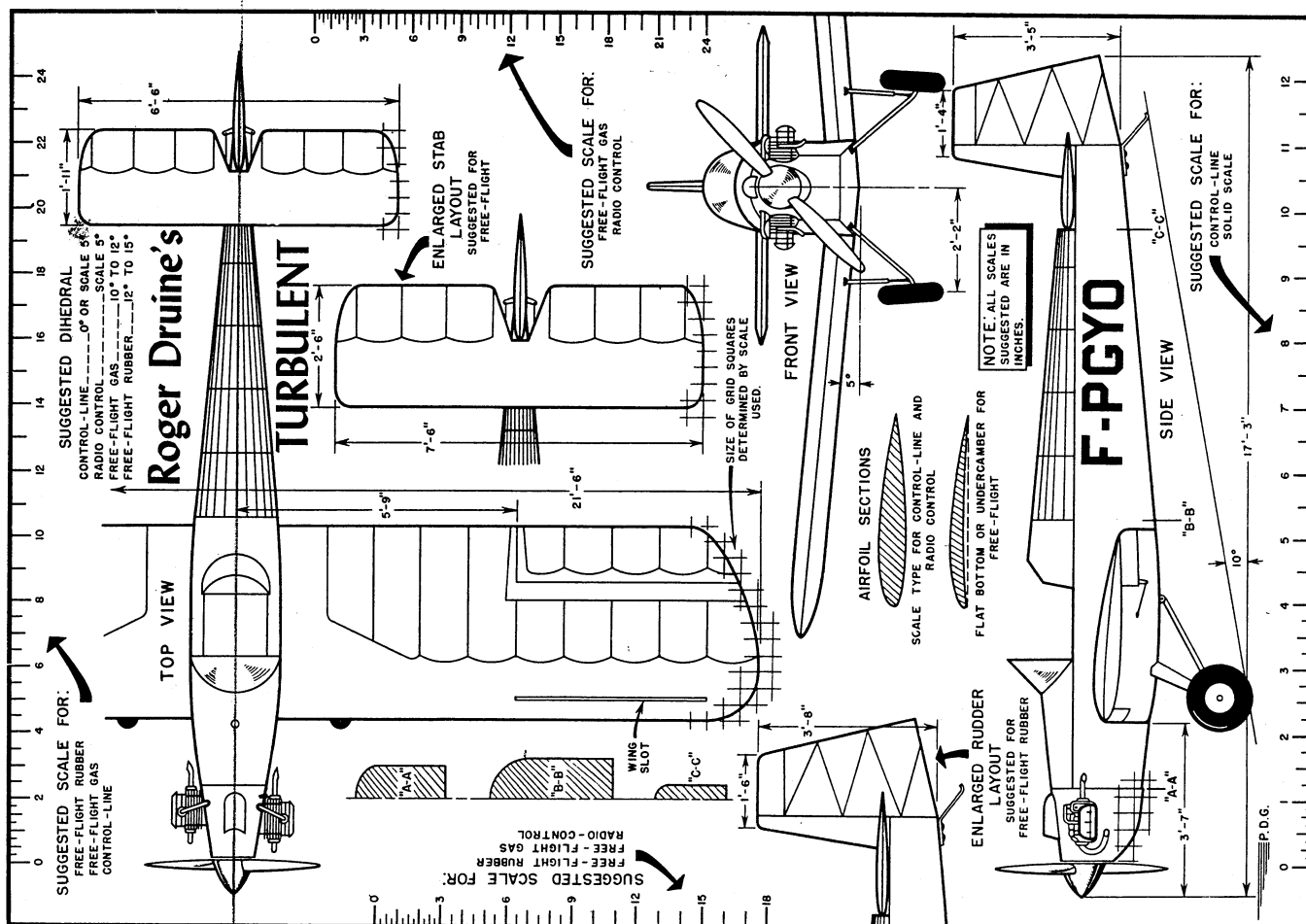


tabs will bind slightly and therefore hold the adjustments.—ROBERT RANDALL, Greenfield, Mass.

Substitute Thinner

If your hobby dealer happens to be sold out of thinner, you can substitute lacquer thinner sold at body shops, hardware and paint stores. You won't be able to buy as small a quantity as is sold in hobby stores, but the investment will keep you in thinner for a long time. A word of warning, though, fuel-proof dopes do not mix with lacquer thinners. Butyrate dope thinners, obtainable at airport supply shops, will do the job however.—BOB KOPSKI, Freeland, Pa.

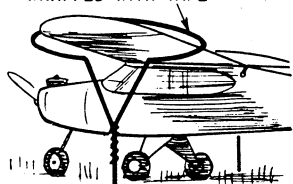




Model Tie-Down

Ever been out on the flying field on a windy day and had your model flipped over and damaged? Well, this is a sure fire preventive. Take two coat hangers and bend as shown. Cover

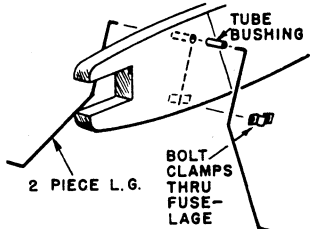
COAT HANGER BENT AND WRAPPED WITH TAPE



wire with tape or cloth wrapping. Slip the tie-down over the wingtips and push ends into ground. FREDERICK C. BRANDT, Toledo, O.

Removable Ukie Gear

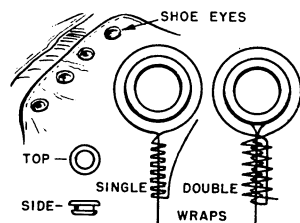
Yo-yo trainers are hard on landing gears, so why not make yours removable for easy replacement. Make the gear in two pieces as shown. Insert a length of brass tubing, inside diameter equal to wire's diameter, in fuselage. Slip the ends of the gear legs in the tubing and clamp it to fuselage side



with straps on both sides. When gear is badly bent or damaged it can then be removed by unbolting clamps. ED SURGALSKI, Beaver Falls, Penna.

Flying-Wire Ends

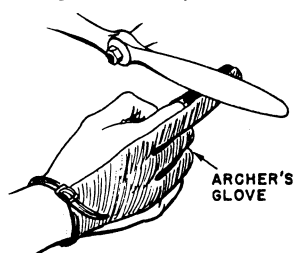
To make a strong loop in the ends of control-line flying wires, add a shoe-eye or similar eyelet. Pass the wire



around the eye twice and double-wrap for a strong loop. Don't rob a new pair of shoes for the eyes or Poppa spunk!—JAMES C. LITTLE, Tiskilwa, Illinois.

Finger Protection

Knuckle busting seems to be a definite part of starting model engines, but you can protect those tender digits by wearing a three-fingered archer's

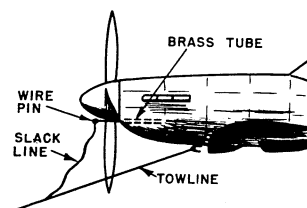


glove as shown. This glove is made of heavy leather and is obtainable wherever archery equipment is sold. J. PAUL MAY JR., East Aurora, N. Y.

Tow-Line Tricks

The rubber-powered flying-scale model has always been a popular favorite across the pond, and from England

comes this trick for getting longer flights from this type of ship: Rig a hook for a towline on the underside of the model. Mount a brass tube in the nose close to the propeller to hold a wire pin, which extends forward across



a propeller blade. Attach a slack line to the pin from the towline so that, when the towline is pulled loose, the pin also will pull loose and release the propeller. This will enable the power to the vertical face for the front crankcase-cover mounting screws and the crankshaft bearing. The horizontal face of the angle is drilled and bolted or screwed directly to the fuselage bottom.

If desired, the mounting lugs can be sawed and filed off the sides of the engine to make the narrowest silhouette possible. Use machine screws slightly longer than standard for mounting the front crankcase cover and the dural mount, to allow for the thickness of the added metal.—ALAN GILKINSON, Rochester, Minn.

Fire! Fire!

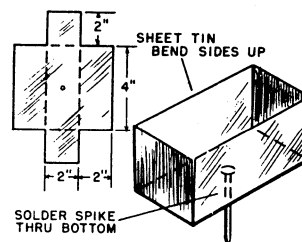
The said sight of a modeler stomping on a burning model is frequently seen on the flying field. Don't let this happen to you—carry your own miniature fire extinguisher in your tool box!

Use the cartridge holder from a CO₂ engine, cutting off the line to leave about 1/4" for a nozzle. Keep the holder loaded with a CO₂ cartridge at all times. To use, screw down the thumb screw and aim at the fire. If the CO₂ gas itself doesn't do the job, the force of the gas will blow the fire out.—JOHN CZACH, Chicopee Falls, Mass.

Can Holder

When the fuel can keeps tipping over in the grass or on rough ground, try this wrinkle:

Bend a piece of sheet tin into the shape shown and solder a large spike

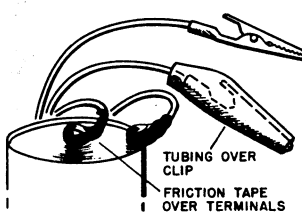


into the bottom. Push the holder spike into the ground and drop the fuel can into it. This will keep the pump spout from collecting dirt.—ROBERT AREHART, Gary, Ind.

No More Shorts

The old problem of preventing booster clips from short-circuiting is solved by this method:

Slip a length of rubber tubing over one alligator clip. Cut the tubing long



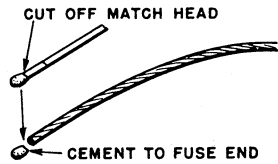
enough to completely cover the clip and make sure you get a snug fit. Use this clip for attachment to the glow plug—it's easy to open the jaws far enough. Cover the battery terminals with friction tape so the clips cannot short out there.—HERB WATSON, Terre Haute, Ind.

HANDY HINTS

Fire Starter

To help light Jetex fuse or dethermalizer fuse, cement a match head to the working end. When ready to use light match head with flame from another match, there will be plenty of heat to ignite fuse.

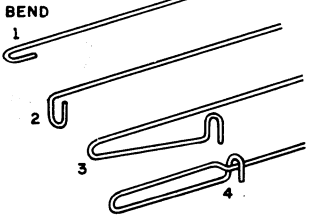
A good method for making dethermalizer fuse is to soak mason string



or similiar absorbent rope in solution of one part saltpetre to three parts of water for about 15 minutes. Let the string dry thoroughly before using it. PALTRINERI ARZEVADO JR., Silvertown, Penna.

Lead Out Ends

Stiff steel wire leadouts on your Control-liner should have the ends

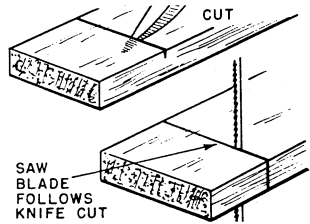


fixed as shown. This is essentially a safety pin type clip and is easily fastened or unfastened to attach or remove flying lines. TERRY HABER, Brooklyn, N. Y.

Clean Jig-Saw Cuts

When cutting $\frac{1}{2}$ " or thicker balsa with a powered or hand jig-saw, the saw blade sometimes has a tendency to wander as it goes through different wood density and grain.

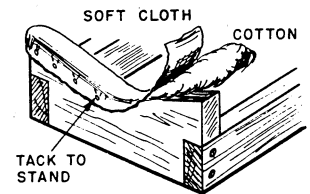
To smooth out the cuts, try this: Cut the wood with a sharp knife before



making a jig-saw cut. The cut need only be about $\frac{1}{8}$ " deep. This cut then serves as a guide for the saw blade. Make the knife cut with a straight edge where possible and by hand on curved lines.—S. C. SMITH, JR., Red Bank, N. J.

Boat Stand

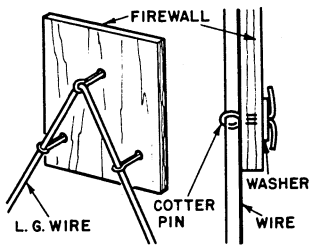
Model boats usually spend more time on their stands than in the water. To prevent marring the bottom finish and denting the wood while transporting the boat in your car, cover the portion



of the stand touching the boat with a good layer of padding. This can be of various materials. Felt weather stripping is good. Sponge rubber is good if covered with cloth (rubber gets gummy as it ages). Or, a strip of cotton covered with soft cloth can be tacked in place.—ROBERT LAHAS
Glendale, N. Y.

Landing Gear Mount

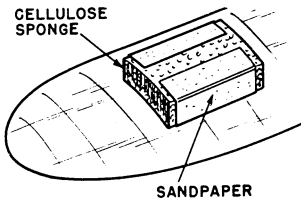
Here's an inexpensive way to fasten landing gear wire to a plywood firewall or bulkhead. Slide cotter pins onto the bent wire and drill the firewall as shown. Push the cotter pins through



holes, put washers over the pins and bend the ends outward. Tap lightly with a hammer to tighten. Cut off excess ends of cotter pins, and cement in place on the model. C. N. ELPHICK, Maitland, N.S.W., Australia.

Soft Sanding Block

To sand curved surfaces smoothly, try wrapping sandpaper around a piece



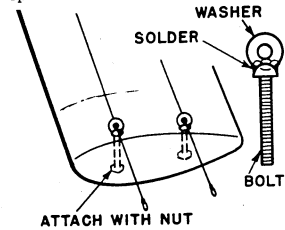
of cellulose sponge. The sponge will bend to conform to the curve of the surface. PHIL COBURN, Detroit, Mich.

C/L Handle Marker

In order to prevent mix ups when picking up the control handle, simply paint the up half of the handle green and the down half red. TOM BALUCH, Fontana, Calif.

Line Guides

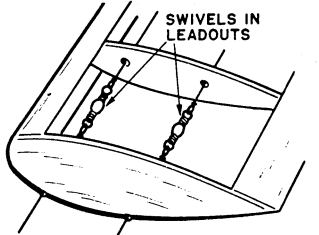
Solder a washer to the head of a bolt to make this simple line guide. Attach it to built-up wings by bolting it to a spar or double rib. Drill holes for the



bolt in a solid wing and fasten the guide with nuts and washers. TOM SHAFTER, Ironton, O.

Hidden Swivels

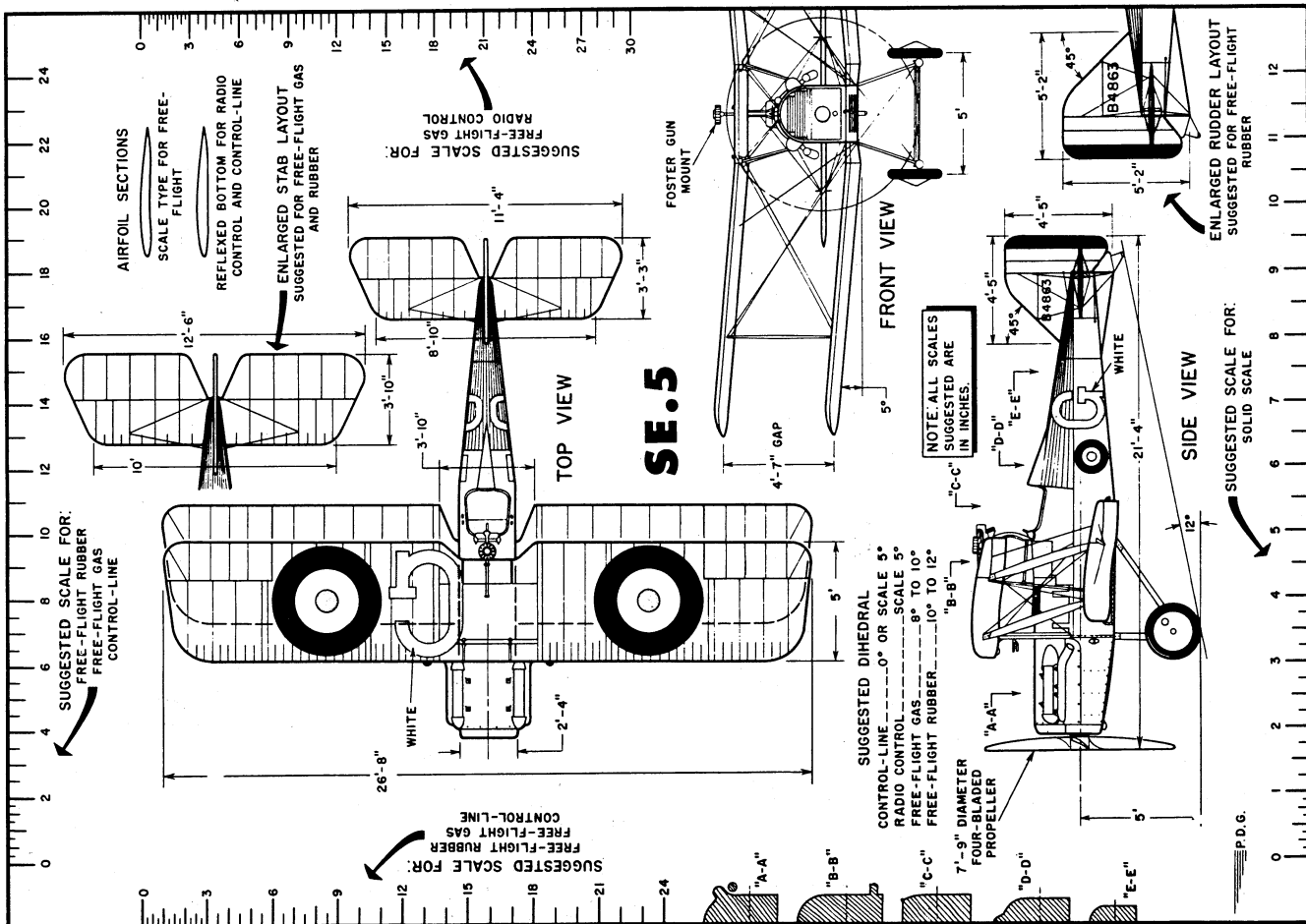
Why not put swivels permanently into a control system inside the wing? Attach the swivels to leadouts between

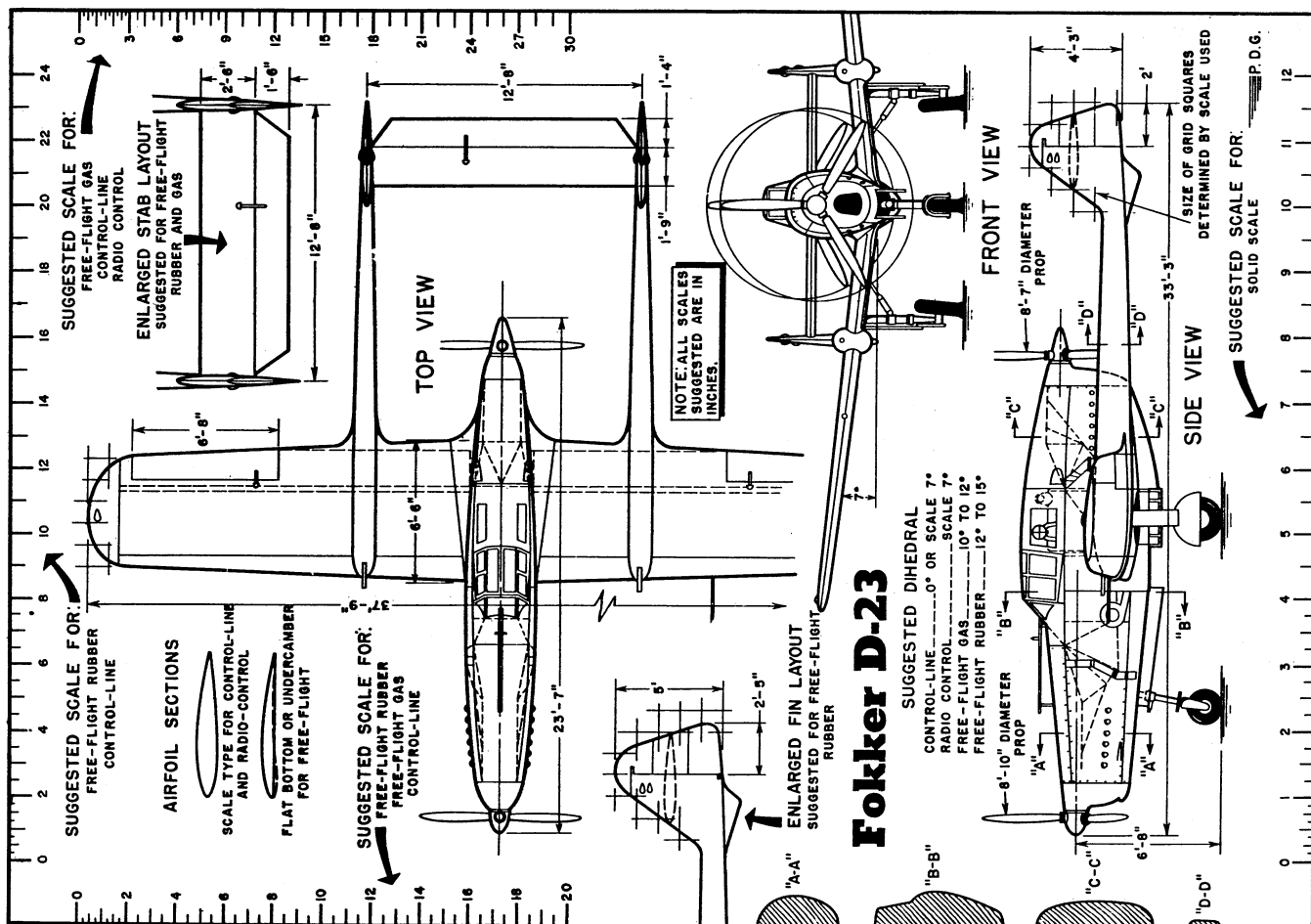


the two outer ribs and add short lead-outs extending out of the wing tip. This will save a bit of drag. KEVIN J. LIERSCH, Victoria, Australia.

Tank Cover

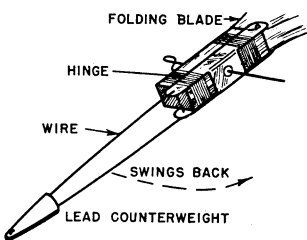
When you install that eyedropper tank on your 1/2 A model, don't throw away the rubber bulb. Use the bulb as a cover to keep dust and dirt out of the tank when the model is not being used. RANDY KLEINERT, Norton, Connecticut.





Folding Prop Tricks

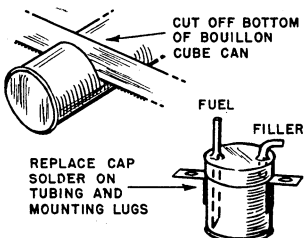
Rubber model fans take note: Why not hinge the counterweight on a single blade, to allow for landing bumps? This will prevent shaft bending and nose-block dislocation. The counterweight easily can be removed and an-



other of different weight substituted when experimenting with various prop blades. The counterweight also can be taken off to convert the prop to double-

Many Tanks

The proper size metal tank for the smaller (.02 to .09) glow-plug engines is often hard to find. Try making your own from a cut-down bouillon cube can. Some dental powders come in small size cans and these also are suitable. Cut down the can to the height desired, put the cap on, and solder fuel line and filler line in place. Be sure the fuel line just clears the bottom of the



tank. If the cap fits snugly, no solder will be needed. However, it would be a good idea to solder it on anyway, just in case. Solder lugs on side or top for mounting.—RAY GREENING, Buffalo, New York.

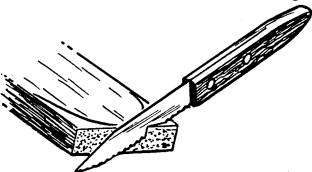
Cement-Proofing Plans

The family electric iron can be used to good advantage on other items besides shirts and skirts. To cement-proof working plans, and also make them transparent for reversing when only one wing is shown, work paraffin into the paper with an electric iron. Set the iron on low heat and rub over a cake of paraffin, then quickly rub iron with the melted paraffin over the plan. Waxed paper can also be laid over the plan and the iron run over this to melt wax onto the plan.

Be sure to lay several layers of newspapers or wrapping paper under the plans, to soak up the excess wax.—PAUL WILLIAMS, Ridgeway, Mo.

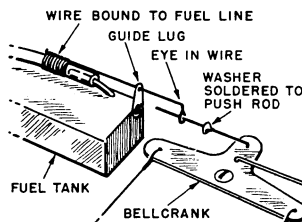
Balsa Knife

An ordinary kitchen paring knife with a serrated cutting edge makes a good balsa knife. When used with a sawing motion, it cuts through all but the hardest balsa. It is very useful for roughing out thick sheets or blocks for such parts as cowlings,



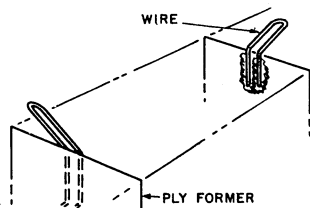
Engine Shut Off

Here's a simple engine shut-off device for team racers. A length of wire is run from bellcrank to tank end of fuel feed line. The wire is bound firmly



Whose Fuel?

To avoid confusion on the crowded flying field, scratch your name on the side of that new can of fuel so that you can claim it when it wanders off. Use a screwdriver point, ice pick or scriber to cut into the paint on the can.—MYRON BRODY, New York City, N. Y.



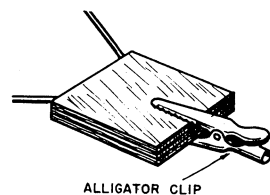
Wing Hold-Down

Wing hold-down dowels or wire pins sometimes bend or break away. Try a new method for making and mounting the wire hold-down. It particularly applies to cabin jobs, but can be used on pylons with variations. Bend hooks as shown and mount so they pass

through plywood strip or formers. Cement well. Cock wire up at a slight angle so the rubber will come off easily in hard landings. Tie one end of the rubber through the wire loop so it will not be lost when the wing pops off.—BOB MANGAM, Brooklyn, N. Y.

Handy Clamps

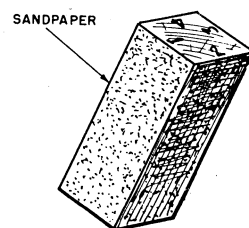
When cementing in hard-to-get-at places on thin layers of balsa or ply-



wood, try using alligator clips for clamps, as shown.—PHIL PILATT, Baltimore, Md.

Sandy Dandy

Make your sandpaper block do extra duty by cementing a different grade of sandpaper to each of the four sides. Number the ends to correspond to the

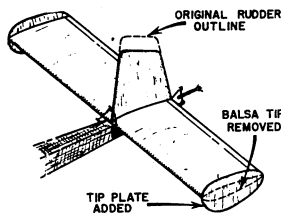


grade of sandpaper on each face.—RICK M. JOACHIM, Plano, Illinois.

HANDY HINTS

Revised Tail Assembly

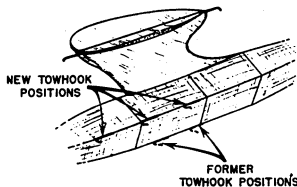
I recently built a Jasco "Streak" and since then have had many flights. However, with the single strut landing gear I used, takeoffs were pretty tricky. To remedy this I cut off the



balsa tips, added 1/16" sheet balsa rudder tip plates, and at the same time decreased the main rudder area about 15%. Performance proved equally as good, and chances of ground looping on take-off were eliminated.—FRANK NEELY, Chicago, Illinois.

Side-Tow Tip

Though Enterprise's "Towline Terror" tows very well under average weather conditions, its small size makes it very difficult to obtain maximum altitude on the towline in gusty weather. To improve the situation, I

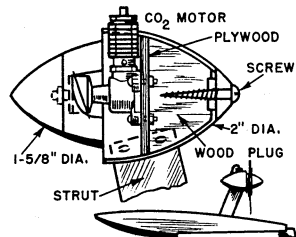


removed the towhooks from the bottom and relocated them on the left side of the fuselage which was also the direction in which I had trimmed the model for the glide. In addition, I also added another hook forward of the original two.—**RICHARD CONTE**, Washington, D. C.

Motor Egg

If you occasionally stray to building prop-driven boats or cars for your CO₂ motor, here is a neat cowling that will add a trim appearance to your model when using the engine as a pusher.

The motor is mounted in a 2" Froom spinner against a circular plywood mount. The plywood is backed up by a

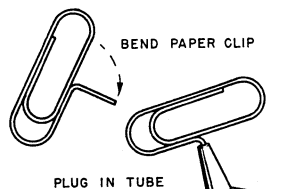


balsa filler block, held into the spinner by a wood screw. Drill the spinner nose for the wood screw. This spinner and engine mount can be bolted to a dural arm or strut-fastened to the model.

Use a 1½" diameter plastic spinner on the prop shaft. This is the two-piece type with the rear section held directly onto the shaft by the prop nut. The front portion is threaded onto the rear portion. It may be necessary to cut ¼" off the rear edge of the plastic spinner to clear the motor cylinder. Two smaller spinners of the same size also could be used.—JOHN E. MORRIS, Hamden, Conn.

Sticky Stuff

When the cement tube oozes out on the bench between squeezings, don't

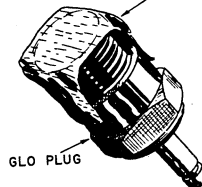


plug it with a nail or pin, try bending a paper clip as shown. This key is larger and easier to use than a pin.—JACK SUMMERS, Redlands, Calif.

Storing Glow Plugs

New glow plugs that are stored in the tool box should have their elements protected from dust, dirt and

SCOTCH TAPE



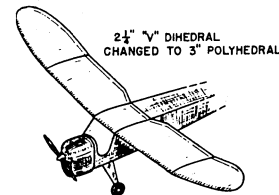
balsa shavings. Simply apply a short length of Scotch tape over the element end and fold over the sides.—TOM SHANNON and BILL STEELE, Stratford, Ont.

Elevator Hinges

Good material for elevator hinges is leather. This is particularly helpful on larger models where strength is needed. Try a strip cut from an old kid or calf glove. Leather can be fastened with cement. We suggest double cementing.—ALLAN EARL, Sharbot Lake, Ontario, Canada.

Contest Conversion

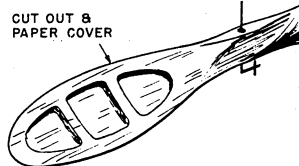
After about sixty flights had been obtained with an Enterprise "Shadow," using an .049 engine, I decided to adapt it for contest flying. To do



this, I increased the dihedral approximately $\frac{3}{4}$ " and changed the wing to a polyhedral-type arrangement. Power was also increased by using an .065 Royal Spitfire.—WALTER PECROS, San Francisco, California

Lightweight Prop

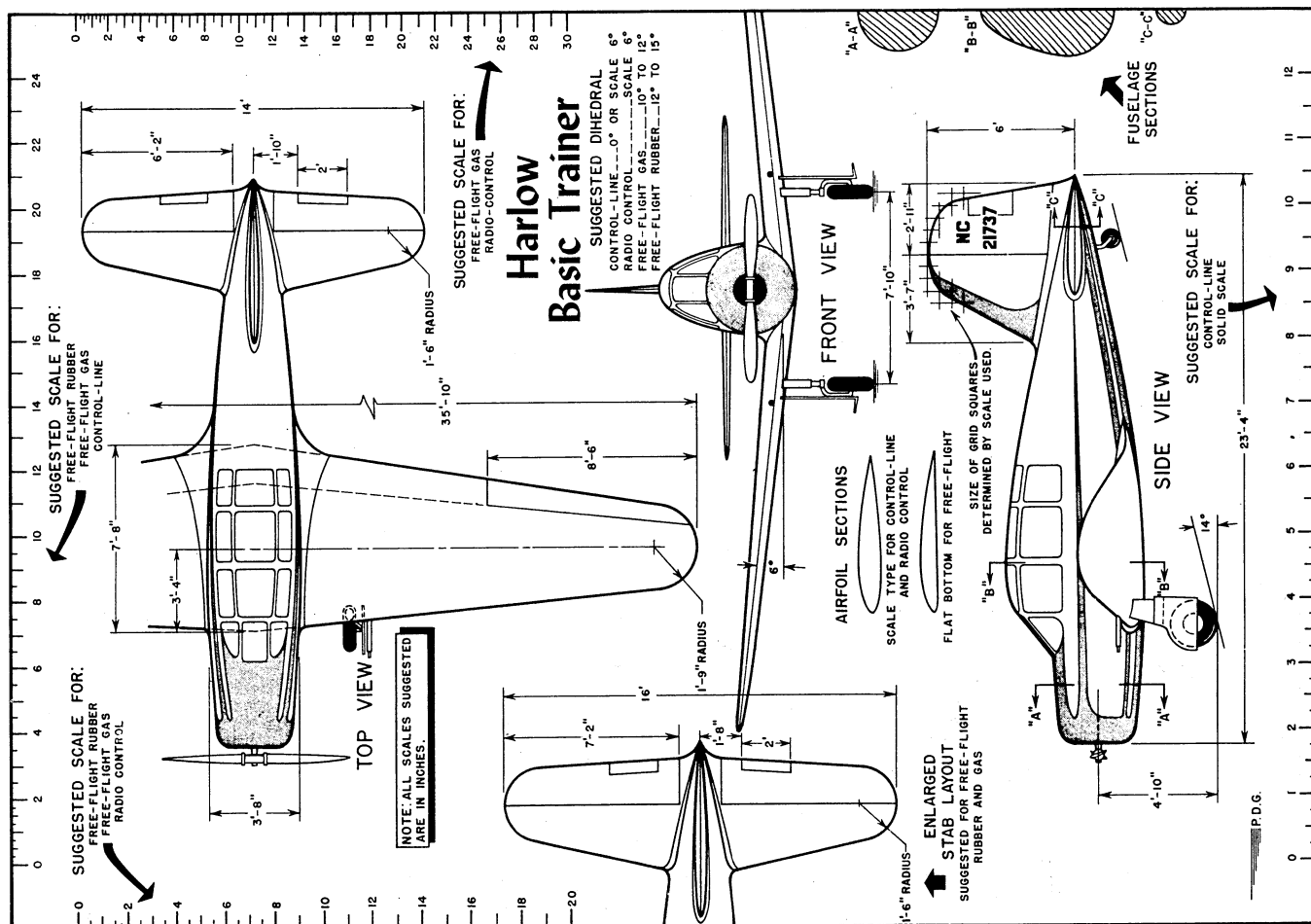
Try cutting lightening holes on both blades of a regular carved balsa prop and covering it with tissue when a



lighter prop is needed for indoor or outdoor rubber jobs.—GENE KASMAR.—Parma, Ohio.

Needle Valve Springs

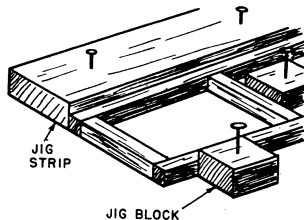
If you lose the spring from the needle valve on engines such as the Wasp, try substituting the spring from an old valve stem taken from a bike or auto tube.—ROGER L. MARVIN, Siloam Springs, Ark.



HANDY HINTS

Better Frameworks

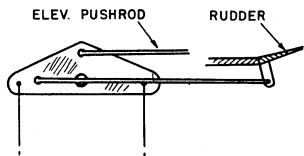
Use thick sheet, together with small blocks, to make a really accurate jig for fuselage sides. Since it is hard to drive pins into building board dead



square, resulting frames may not be accurate. Pins also may cause light strips to crack at sharp bends. The blocks will prevent this.—G. WOOLLS, Bristol, England.

Rudder Control

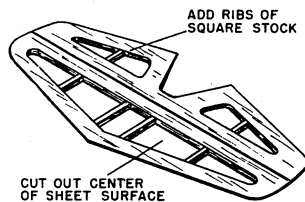
To help stunt ships stay out on the end of the lines, why not get help from the rudder? This system utilizes a second pushrod hooked to the bellcrank, which moves the rudder out-



ward when up or down control is given. Travel is slight at the bellcrank, so the horn or rudder should be fairly large to get enough movement. Neutral setting should have about 10° offset, with about 20° full offset.—ROLAND E. WOOD, Richwood, Ohio.

Lightweight Stabilizer

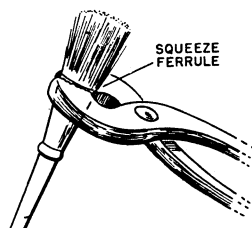
To reduce the weight of sheet balsa tail surfaces on control-liners, try this construction method: Cut out the center of the surface, leaving about 1/4" to



3/4" balsa all around. Add ribs of square stock of the same thickness as the sheet surface. Cover with paper. On bigger models two layers of paper should be used.—RICHARD SARPOLUS, Cranford, N. J.

Tightening Brush Bristles

Dopes and thinners have a way of loosening the hairs in even the most expensive brushes. If your brushes leave hairs on that fine finish, try this trick.



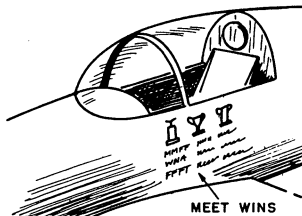
When you buy a new brush, squeeze the metal ferrule just above the hair end. Use pliers or a vise. This will lengthen the brush's life and prevent hairs from dribbling out.—ROBERT SHUAK, Stockholm, Sask., Canada.

Slow Go

For testing those glow-plug free-flight ships, just put the propeller on backwards, instead of running the engine rich as some modellers do. This slows down the plane enough for testing. Later, when the plane is fully adjusted, just turn the prop over and fly full speed.—DON OWEN, Galveston, Texas

Score Board

If you've won a few contest awards with your favorite model, why not keep a record of it? Make a scoreboard of plywood and paint your listings on it. Trim-Film can also be used. A miniature trophy, with location, contest and how you placed, can be shown. A similar listing can be put on the model itself, along the cockpit, in the same manner as combat kills are re-



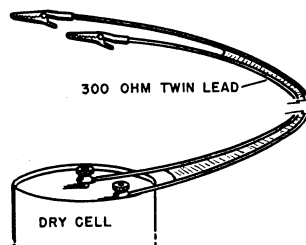
corded on real airplanes. Team racers can have small checkered flags.—DICK NEAL, Thorntown, Ind.

Handy Clamps

Holding scale plastic model parts together while cement or solvent dries can be aided by using spring-type clothespins. These can be used on most thin parts such as wings and tails and small diameter fuselages. Patches of scotch tape or masking tape across seams can be used in same manner where clothespins won't fit. DON HERTZFELDT, La Crosse, Wisc.

Booster Leads

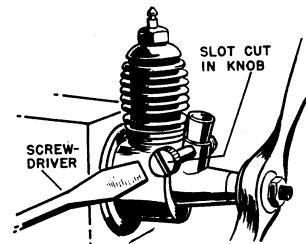
Get a length of the 300 ohm twin-lead wire used for television installation to make your next set of booster



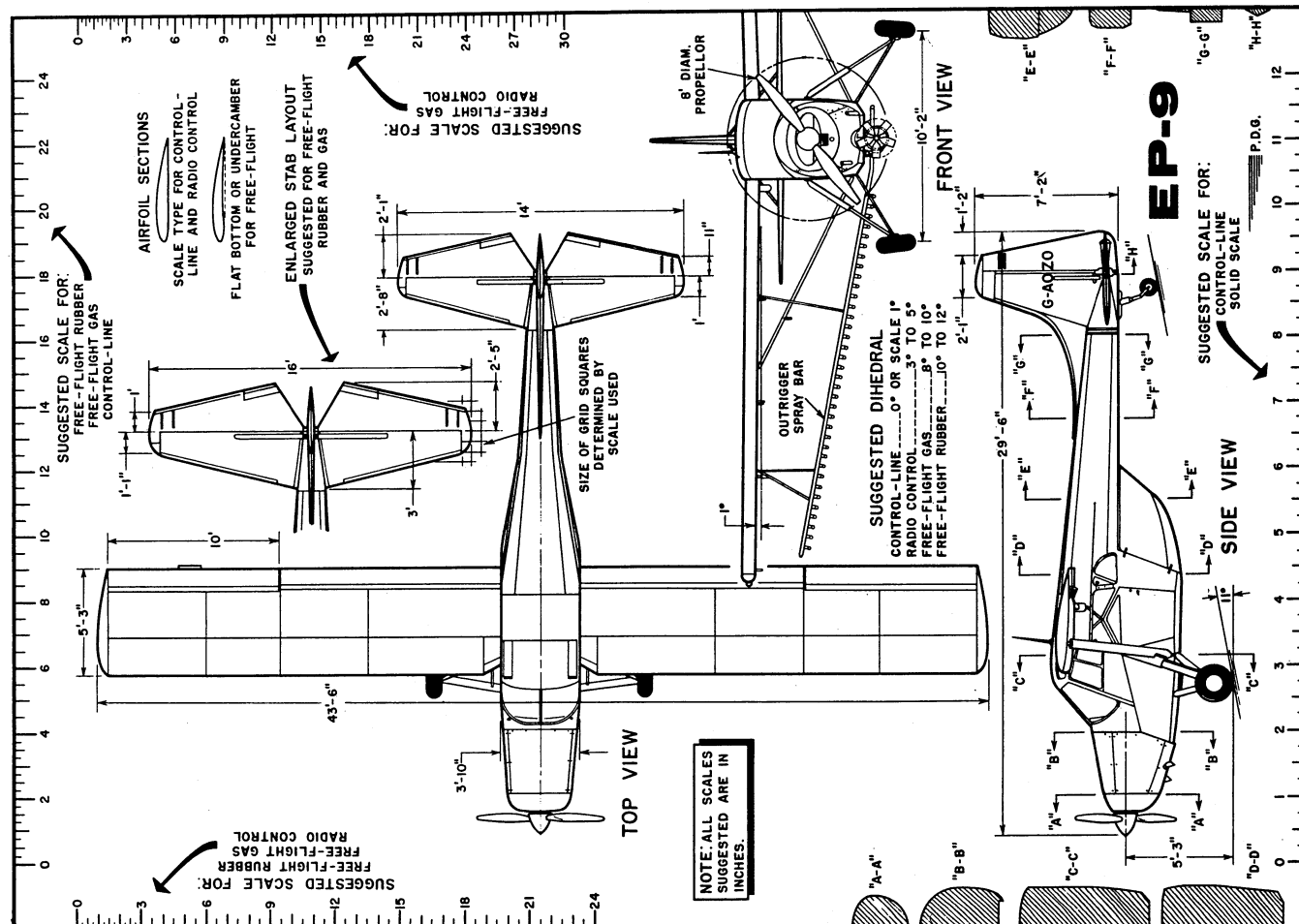
leads. Solder lugs and alligator clips on ends, and separate center insulation at ends as shown.—RAY GREENING, Buffalo, N. Y.

Tuning Tiny Throttles

If you have difficulty turning the needle valve on the smaller engines while they are running, try this trick: Take the needle valve out of the engine and file or cut a notch across the knob, using a thin file or hack saw blade. The



needle valve can then be turned with a screwdriver while the prop is turning. This also is helpful when the engine is cowed in and the needle valve partially covered.—JERRY HARTER, Bothell, Washington.

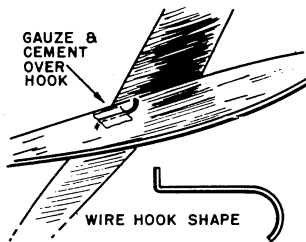


HANDY HINTS

Glider Finger-Rest

The mighty heave used when flying hand-launched gliders is sometimes rough on wing trailing edges. To preserve your glider wings, try installing this wire hook on the fuselage side:

Bend the hook to the shape shown, bury the short straight end into the



fuselage, and double-cement the hook into position so that the curved end sticks out parallel to the wing. Cover the installation with a patch of silk or gauze.

The hook should be located on the fuselage just under the trailing edge, where your forefinger can get a comfortable launching grip. —REGGIE MILLER, Port Austin, Mich.

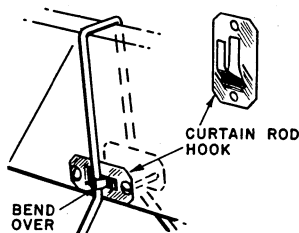
Cowling Strengtheners

Use ordinary surgical gauze to strengthen thin-carved cowling or other model parts. Dope or cement gauze strips over the whole inside area. Run the strips across each other and build up several layers if needed. —BERNARD MARDEVILLE, Troy, N. Y.

Gear Mounting

Landing gears on profile models sometimes work loose because of hard landings and vibration. Try this method to anchor the gear strongly:

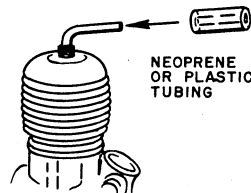
Curtain-rod hooks (obtainable at hardware stores) are bolted or screwed to the fuselage sides. The punched-out center, forming the hook, is bent around the gear wire. You can make a



similar anchor strip by cutting a groove in a flat strip of aluminum or brass. —H. DUALM, Bayonne, N. J.

Diesel Hot-Pad

The variable compression screw on a small diesel often gets very hot. To avoid burning your fingers, fit a short



length of neoprene or plastic tubing over the part you handle. —H. WESTWOOD, Middlesex, England

R/C Tube Storage

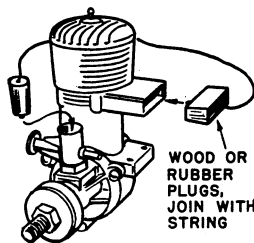
Some brands of cigars are packed individually in an aluminum container. This is a good storage can for small parts, such as radio tubes. The container will take two tubes neatly. Stuff the can ends with cotton so that the tubes won't rattle around inside. —JIM O'BRIEN, JR., Bellerose, L. I., N. Y.

Paper Covering

When wet-covering compound curves on model structures with silkspan, a small amount of detergent added to the water will make the paper extremely pliable, for an easier, smoother job. —J. K. MEYER, Glendale, Calif.

Engine Dust Covers

To eliminate the use of a dirty and often unattractive rag for keeping dust and dirt out of model airplane engines, I use two small inserts, similar to those shown, which fit snugly into the ex-

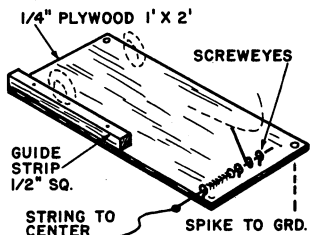


haust stack and venturi (air intake). These can be made in a few minutes from scrap balsa or foam rubber. They do the job, are easy to handle, and do not detract from the appearance of the plane. —J. W. SCHERER, Wyckoff, N. J.

Still Another Stooze

If you fly alone, you'll find this a handy helper. It features an improvement over other stoozes in that there is a guide to keep your model in proper launching position while you are getting out to the center of the circle.

Use a piece of board or plywood for the base. This can be nearly any size,

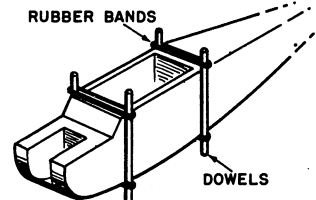


but should accommodate the landing gear of your model. The stooze release

consists of screw-eyes and a wire pin, spring-loaded. A strip of wood along the inside of the base acts as a wheel guide, to get the model off straight. —A. J. WHITE, Leominster, Mass.

Building Clamps

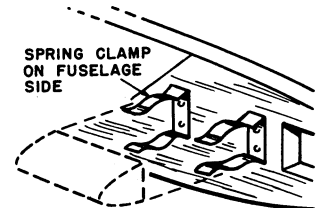
When joining fuselage structures of box-type construction, this method will aid in applying pressure in the right



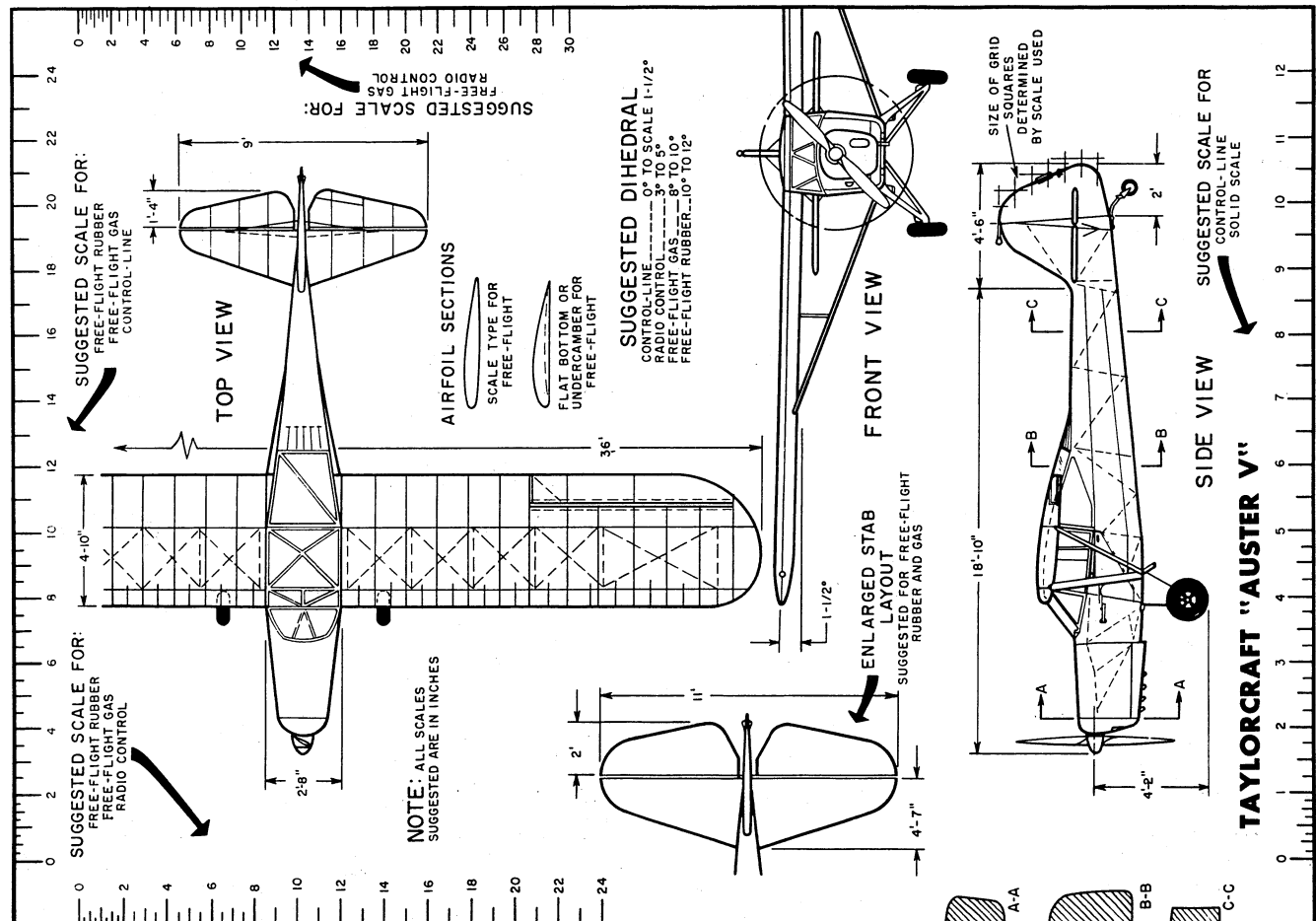
place: Use lengths of dowel or strong square stock up the sides of fuselage, and wrap the ends with rubber bands to apply pressure. —C. D. FIELDS, St. Louis, Mo.

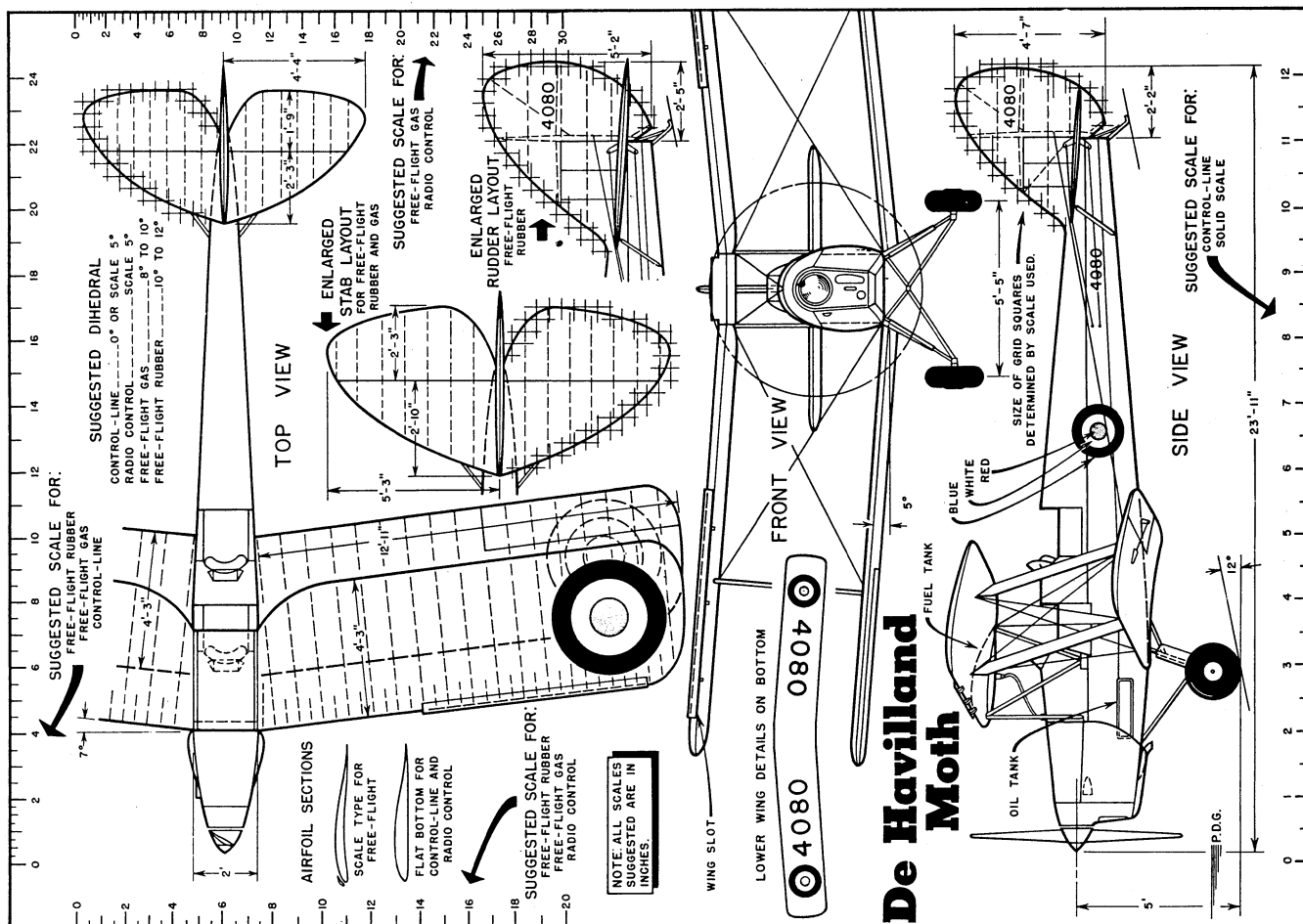
Tank Mount

Having trouble keeping the fuel tank in place on your profile model? Try this wrinkle: Hardware stores can supply spring clamps of the type used for hanging up brooms and tools. Simply screw or bolt two of these clamps to the side of your model. Slip tank in place in the jaw of the clamps. This system is also handy for removing the



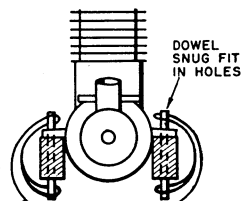
tank when cleaning the model or for changing to a larger size tank. —HILTON RIVERA, Astoria, L. I., N. Y.





Breakaway Engine Mount

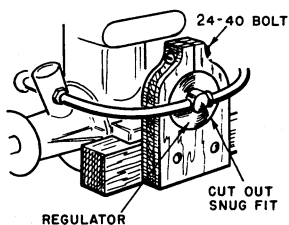
Here is a variation on the beam mount for 1/2A engines. The mount is strong enough to hold the engine rigidly in place, but will come apart if the model hits something solid. Drill holes in the beam mount in the regular manner, under the engine mounting lugs. Then instead of using bolts, insert dowels through the lug and beam. Let the dowels project a bit above and below. Hook a rubber band over the dowels and stretch it tightly under the engine over the dowels on the opposite side. A bad blow will break the dowels or pop the rubber bands off, saving the engine from



serious damage.—PAUL R. BIEN, Cincinnati, Ohio.

Regulator Clamp

This clamp, made of 1/4" plywood and a 4-40 motor mount bolt, when cemented to the motor mount or a



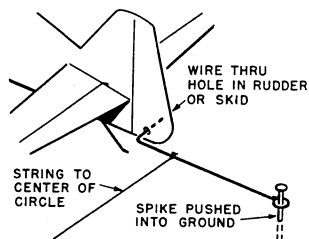
slot in the fuselage, will reduce vibration and keep the pressed-in connection on the Walker fuel regulator from working loose and leaking air. The regulator may be readily removed for cleaning or replacing, without removing the mount.—C. H. ROBISON, Ottumwa, Iowa.

Balsa Filler

The never-ending search for a perfect balsa grain-filler still goes on. Here's another idea: Add powdered Fuller's earth to sanding sealer or clear dope to make cream thick mixture, dope on and sand in regular manner.—BRUCE SHERWIN, Central Valley, N. Y.

Simplified Stoooge

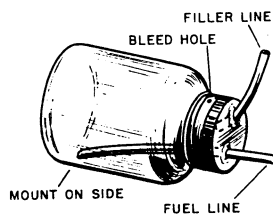
For the control-line fans who want to fly when there is no one around, here is a very simple helper: Bend a wire around a spike so that it pivots.



Punch a small hole in the rudder for the hook end of the wire, then tie a string (about the length of your control lines) around the wire near the hook end. Push the spike in the ground almost to the head, but leave room for free movement of the wire, place the string parallel to your flying lines and hook the wire into the rudder. The plane will stay put until you release it by pulling the string, thus unhooking the wire from the rudder.—FOSS RATTE, Brattleboro, Vt.

Free-Flight Fuel Tank

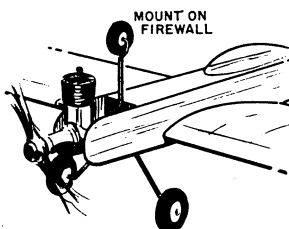
A visible fuel supply is helpful for timing glow plug engine runs when no timer or engine cut-off is used. The use of an eye dropper for the small engines has led to this idea: Use a small dope bottle for a fuel tank with the larger engines. Clean thoroughly and solder the fuel lines into the cap, as shown. Bury tank in fuselage structure with



one side visible, or strap on to outside.—DON MILKENT, Kenosha, Wisc.

Crash Insurance

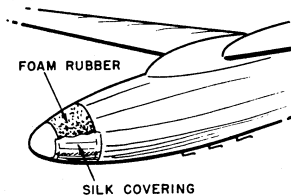
To save glow plugs and prevent engine damage when learning to fly



planes inverted, mount a small diameter wheel on the fuselage top, extending above the engine.—CHARLES HOLPHEN, Opelousas, La.

Shock Absorber Nose

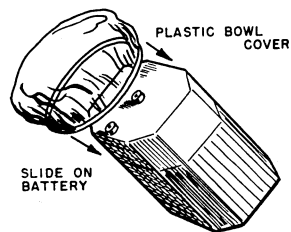
Sailplanes and gliders take a real beating in the nose section. Try adding a shock absorber to your next model. Cement foam rubber between



two of the nose formers and cover with silk or nylon sewn in place. Use Pliobond to fasten rubber to wood.—PETER SAYER, Warwickshire, Eng.

Short Preventer

To prevent your booster battery from shorting while being stored in your tool box, try this wrinkle: Place an ordinary plastic bowl cover over the top of the battery. This will pre-



vent the binding posts from coming in contact with the sides of the box or the various tools in the box. Remove wires first.—LAIRD CROWE, Oklahoma City, Okla.

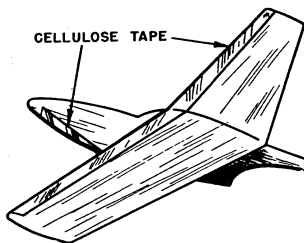
Ignition Fuel Hop-Up

Add a bit of glow to your ignition fuel to start a balky engine or do cold weather flying.—P. BLAIS, Montreal, Canada.

HANDY HINTS

Glider Insurance

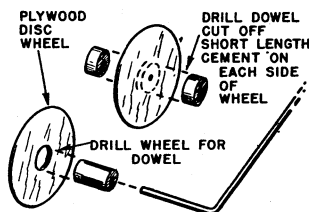
To prevent minor dents and splits in the leading edges of glider wings, fold a strip of $\frac{3}{4}$ " or 1" wide cellulose tape



over the length of the leading edge. The same trick applied to the nose and belly will save the surface at these points.—MICHAEL KRIM, N. Y., N. Y.

Wheel Hubs

Lightweight wheel hubs for rubber-powered or free-flight gas jobs can be made from a short length of hardwood dowel. Drill the axle hole first, then cut dowel to the desired length. The wheel disc can either be drilled for the dowel or the dowel can be cut in short lengths

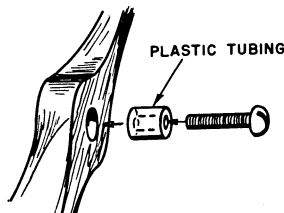


and cemented on each side of the wheel.—JAMES H. HARVEY, Santa Maria, Calif.

Prop-Hole Reducer

Frequently the prop you wish to use on a certain engine has a hole larger than the prop shaft or shaft screw. If you fly $\frac{1}{2}$ A or small Class A engines, you probably have come across this problem.

To save the trouble of finding or making a metal reducer for the shaft, slip a short length of fuel-line tubing into the prop hole. Use tubing with an outside diameter which is a snug fit in the prop. If the screw or shaft is too large for the tubing, let the threads

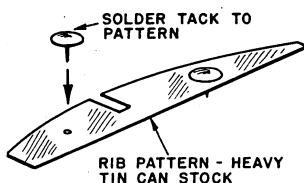


cut the inside of the tubing to size by turning the tubing onto the shaft.

Engine heat will soften tubing, so it will not last long—this is a good emergency trick only.—MELVIN FARRER, Fort Bragg, Calif.

Wing-Rib Pattern

When cutting out a large number of wing ribs of the same size, make a sheet-metal pattern to use as a guide. Punch two holes in the pattern and

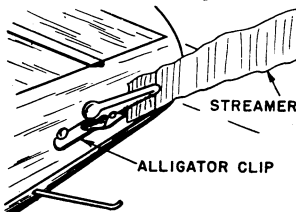


solder a thumb tack through each hole. The tack points are pressed into the wood stock to keep the pattern from

shifting while you cut around it with a knife or razor.—RONALD KENNEMER, Fontana, Calif.

Combat Ribbon Hook-Up

For a quick, secure attachment for the ribbon on your combat jobs, fasten an alligator clip under the tail of the model. Flatten the rear part of the clip and either drill a hole through it for screw attachment to the plane or bend



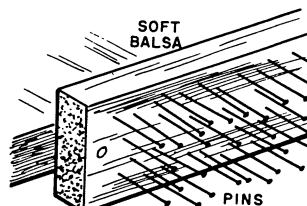
its end and cement this into the tail.—PHIL HARVEY, Seattle, Wash.

Storage Tray

A plastic tray for silver makes a good storage tray for tools, brushes, cement tubes, etc., in your workshop. Such trays can be purchased at hardware or kitchen-furnishing stores.—CLINT SCOBLE, Hamden, Conn.

Pin Cushion

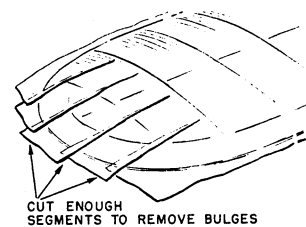
A length of soft balsa sheet tacked up over the workbench makes a handy pin cushion, preventing pin pricks when



reaching into a container full of pins.—LARRY HAMM, Dover, Ohio

Covering Wing Tips

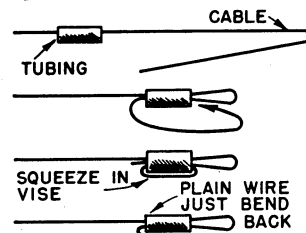
● Covering wing tips usually presents a problem because the paper must cover compound curves. Try cutting segments as shown to produce a neat job. Overlap towards the trailing edge. Dope the



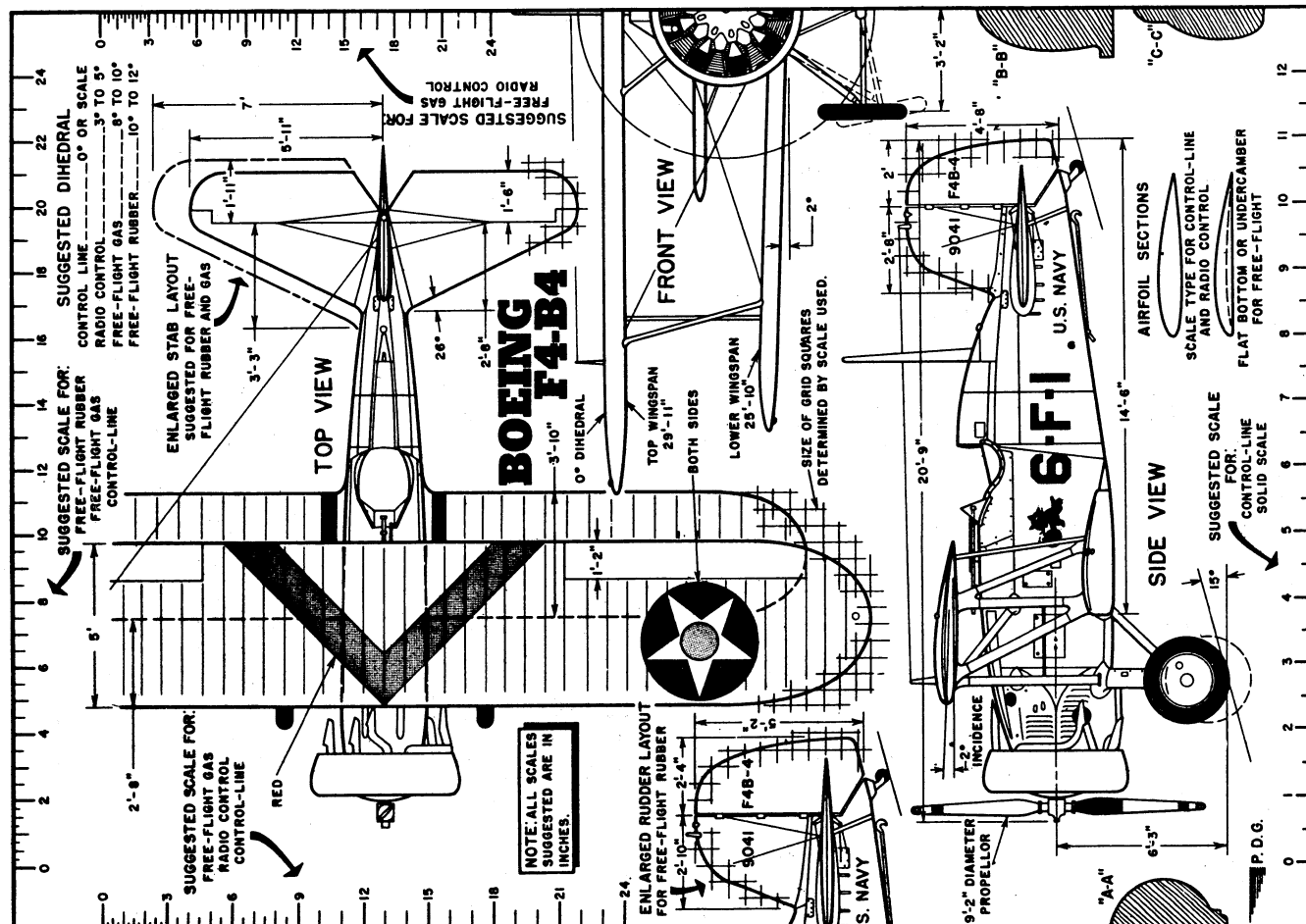
rear segment down first, then work forward.—KENNETH TROXELL, Frederick, Md.

Wire End Loops

When making up control-line lead-out wires on flying lines, borrow the commercial trick of using tubing clamps instead of wire binding. For flexible wire, run the short end through the tubing twice, as shown. Regular steel wire need only be bent back along the tubing. Use soft copper or brass tubing of about $\frac{3}{32}$ " O.D. for wire up to $\frac{1}{32}$ " diameter. Clamp the tub-



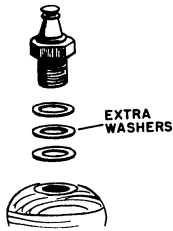
ing in a vise to squeeze it around the wire.—ARTHUR PERGAM, Willow Grove, Pa.



HANDY HINTS

Long And Short Of It

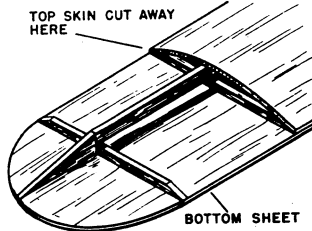
Have you ever been caught without a short type glow plug when flying your 1/2A ship? If you have a long thread plug from a larger engine available, the trouble can be solved in this manner: Add enough washers (plug gas-kets) to shorten the threads. Then,



check for compression leaks by putting a few drops of fuel on the plug and flipping the prop a few times. If bubbles appear at the plug washers, try other washers that are newer and smoother.—STUART CULP, Bethany, Missouri.

All-Wood Wings

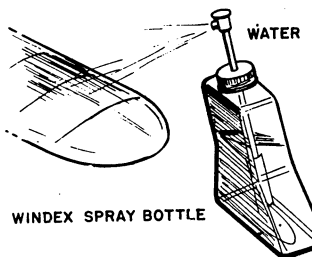
A simple method for building strong, light wings for rubber models or small gas jobs is shown here. Use a sheet the width of the wing. Put light strips, such as 1/8" square, across the chordwise. At the high point of the



upper camber, lay a spar of about 3/16" square. The size will be determined by the thickness of the airfoil

Little Squirt

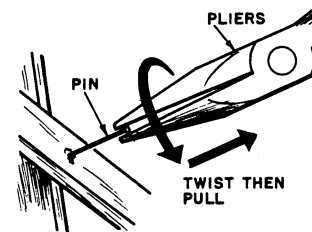
If you wish to water-tighten the tissue on your model, try this: Use an empty window-cleaning spray bottle, filled with water. Clean spray pump thoroughly before using. Spray model



evenly to avoid excess warping.—RICHARD RIEGER, Houston, Texas.

Pulling Pins

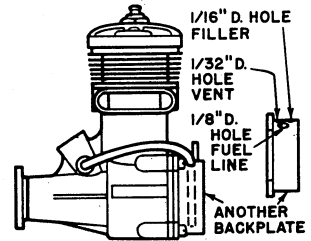
Here's a simple trick that may be overlooked by most modellers. When pulling pins from cemented structures



grasp the pin head with pliers and turn or twist the pin to break it loose from cement that may be surrounding it. Then pull the pin out. TOM MARKLAND, Cincinnati, Ohio.

Free-flight Fuel Tank

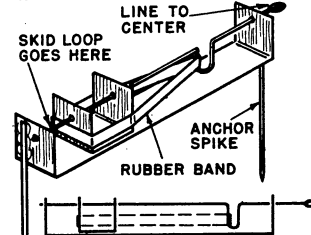
Engines such as the Fox and K&B Allyn with recessed crankcase backplates are well suited to this trick. Obtain an additional backplate and drill for filler, vent, and fuel line as shown. Attach the backplate over the regular backplate with another gasket between them. Use longer screws if necessary.



Fox 29 and 35's run 30 to 40 sec. on fuel contained in this backplate tank. A Fox 19 will run a bit longer. Prevents fly-aways from stuck timers. The space in tank can be reduced to hold less fuel by adding small blocks of hardwood if no timer is used. CHUCK PETERS, Ft. Smith, Ark.

Still Another Stooze

Most stooze designs have a release pin that is pulled completely out of the stationary parts. Here's one that eliminates this feature and has simple return and reset features:

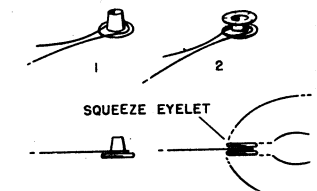


Make all flat parts from sheet brass or aluminum and bolt or solder as re-

quired. Use steel wire for anchor pins and release rod. Return actuator can be a spring or rubber band. SP2 JOHN M. ROWLAND, Denver, Colo.

Wire Ends

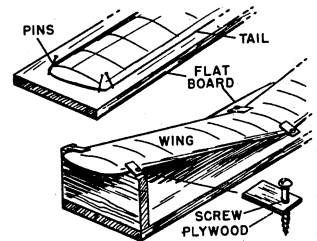
For extra safety when putting the eyelets on control-line wire ends, it is a good idea to squeeze the rims of the eyelet together so that the wire won't



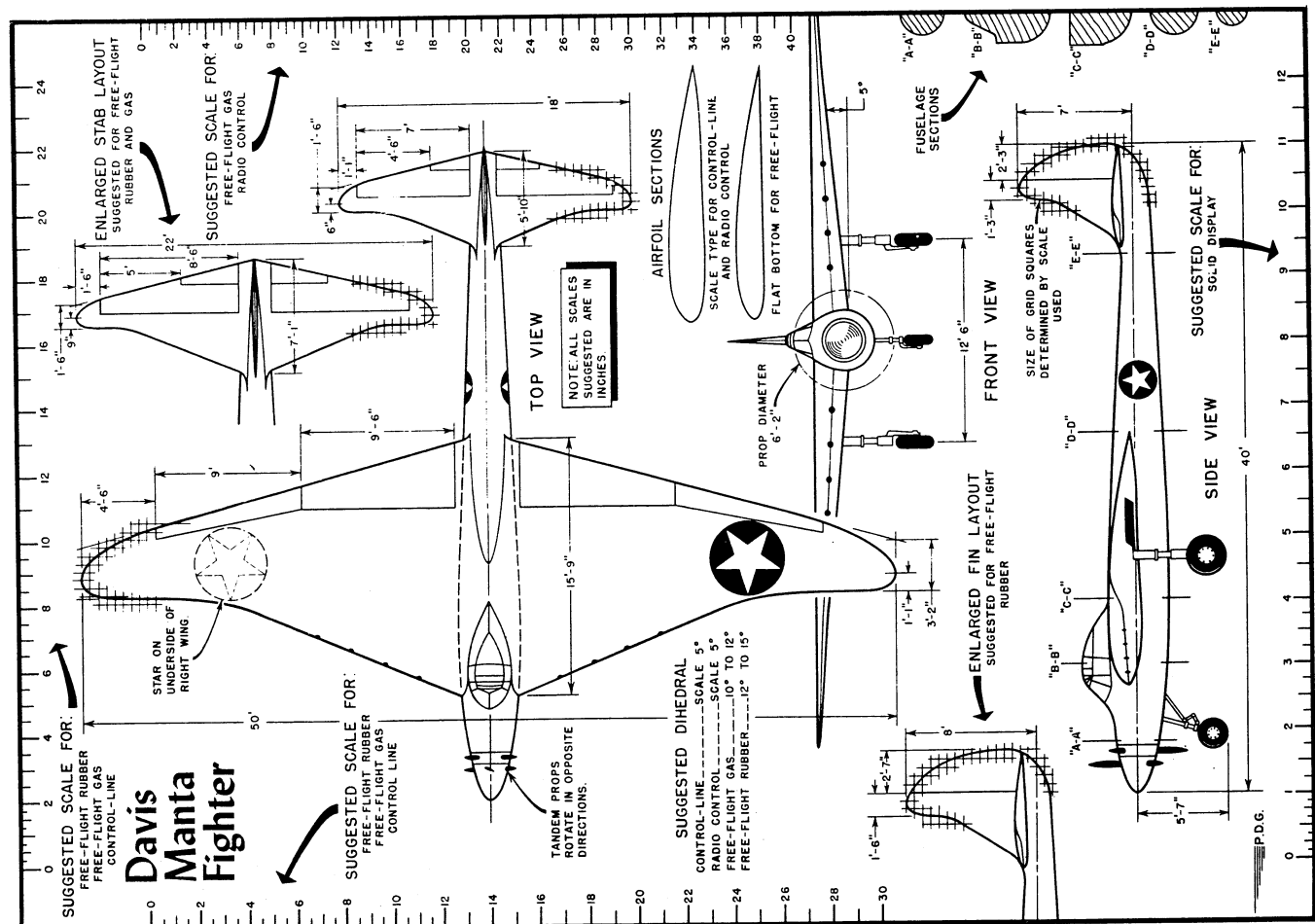
come off. This also helps to keep the eyelet in place while binding the short wire end down.—MARTIN GOSKY, Lakewood, Ohio.

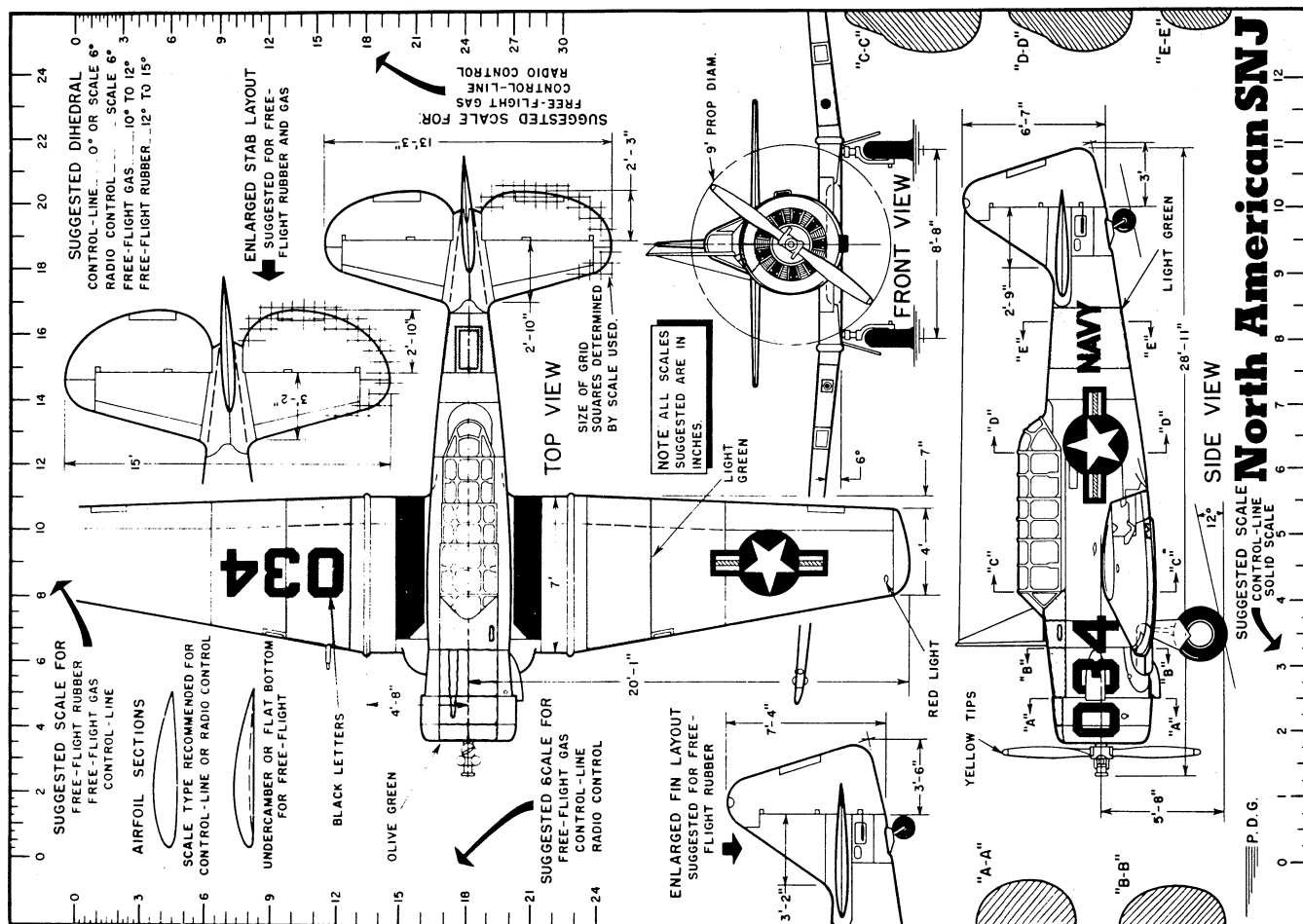
Warp Prevention

To keep tail surfaces and wings from warping while being stored, this method is a good one: Get a good piece of flat board or plywood a little larger than the surface and pin the surface



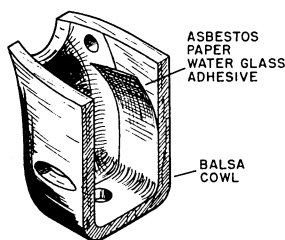
down on the board as shown. Small clamps can also be used. Make them from a short strip of thin plywood and hold down with a small woodscrew.—BOB CRAWFORD, Muncie, Ind.





Cool Cowlings

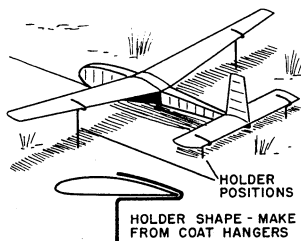
With enclosed engine installations such as those used on team racers, scorching and burning of the inside of the cowling sometimes occurs. Try lining the inside surfaces around the en-



gine with asbestos paper. On small models, use the thinnest grade paper available. On larger models, where weight isn't such a problem, you can use 1/16" sheet asbestos. Use water glass as an adhesive for applying the asbestos paper.—Ralph Joline, Jamaica Plain, Mass.

Towliner Stooze

If you want to fly your towline glider without assistance, bend up coat hangers as shown. Push the wires into the ground, in the location indicated. Be



sure the glider is aimed into the wind. Lay out your towline and start your

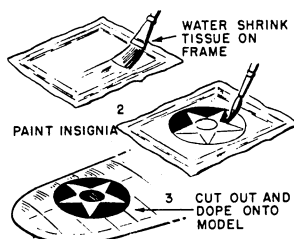
launching run in the usual manner.—Virgilio Ilagan, Gerona, Tarlas, P. I.

Float Spray

New clear spray plastics which are on the market (such as Quik or Krylon) provide an excellent lightweight "seal" for float bottoms of R.O.W. models. The plastic seals both tissue and clear dope without adding weight and without smearing. Fuel-proof qualities are only fair, however. NORMAN MICHIE, Madison, Wis.

Flying Scale Decoration

● Instead of trying to paint scale details (such as insignia or numerals) on the fuselage and wings after your model is completed, try this:

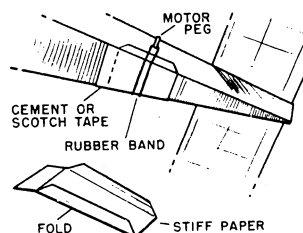


Make a simple balsa strip frame slightly larger than the particular decoration. Cement a sheet of tissue onto the frame. Water-shrink the tissue on the frame. Then flatten the tissue and draw in and paint the decoration. Next, cut out along the outline and dope in place on the model.

Use thinned clear dope and work quickly in order not to make colors run. Numerals can be cut to size out of black tissue and doped directly to model. Use regular tissue for rubber models, and heavy tissue for gas jobs.—MIKE McALLISTER, New York, N. Y.

Hatch Cover

Here is an idea that will help keep dirt, field mice and grasshoppers out of the rear end of your rubber model.



Usually an open hatch is left at the rear motor peg for access to the motor. A stiff paper cover hinged at the front and covering the hole and sides will serve to keep the rear end clean and tidy. See sketch.—RUDY PRIKOSOVICH, South Bend, Ind.

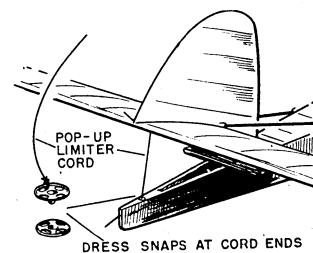
Glow-Plug Booster Clips

If your alligator booster clips get lost, strayed or stolen, try these equally good substitutes: Take an ordinary round heavy-duty soldering lug and cut out a small notch to allow the lug to be slipped over the knob of the glow plug.

With some glow plugs, the regular high-tension ignition wire clip can be used. These clips can be used on both booster leads—sliding the other clip over the crankcase bolt or onto the exhaust-stack edge. Pinch back together with pliers when the clips open up through use.—GERALD HAMLOWE, Bloomington, Ill.

Removable Pop-Up Tail

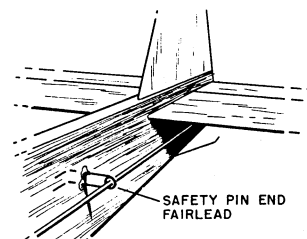
After fumbling around on the field for many an hour tying limit strings on a pop-up tail, it was found that a very simple and much used device could be applied with success. By the addition of a simple dress snap on either end of the limit string, removal of the tail assembly is made both easier and



faster. Be sure to cement half of the dress snap very securely to either the tail assembly or fuselage. This works well with Class A or smaller models, but for larger ones a snap fastener of the type used for control-line ends is needed.—Fred Otten, Brooklyn, N. Y.

Pushrod Fairlead

On profile planes, the pushrod has no brace and sometimes bends from the opposite forces formed by the bellcrank and the slipstream over the elevator, resulting in a lack of control. Many braces are in use, but an unusual one that works easily is this: Cut the snap end off a safety pin, thread the pushrod through the loop

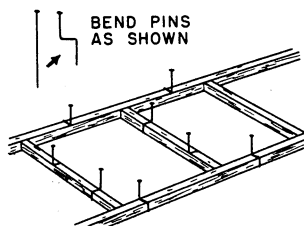


on the other end, and push the two sharp ends into the fuselage, bend over and cement well. More than one may be needed.—Stuart Culp, Bethany, Mo.

HANDY HINTS

Bent Pin Kink

● To prevent splitting or piercing small-size balsa strips when building model parts on the work board, bend pins as shown. Stick pins into board on



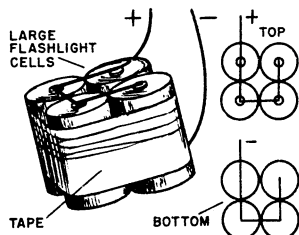
the outside of curved sections to hold in place. The right-angle bend will hold the work tightly against the flat surface.—JOE W. WRIGHT, Gormley, Ont., Canada

Glass Work Top

When working on plastic or other models that don't have to be pinned to plans, put the plans under a sheet of glass and work over it. This will hold plans in place, give you a smooth working surface without danger of marring table or desk, makes plans easier to see, keeps them from being mislaid, and cement and paint can be cleaned off easily with a razor blade. ROBERT EVANS, S. Cannellsville, Pa.

Handy Glow-Plug Boosters

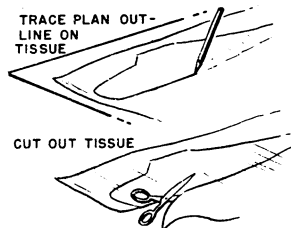
If large dry cells are temporarily unobtainable, try using four large flashlight batteries wired in parallel as a substitute. This pack also makes a light



handy unit to carry for contest work. Bind four cells together with Scotch or friction tape, and solder the wires in parallel, as shown, to obtain 1½ volts. Battery life will not be as long as with large dry cells, so use this only as a substitute booster.—DON BARBAY, Beaumont, Texas.

Paper Work

Covering models with tissue can be made easier if this procedure is followed: Lay the tissue over the plan drawing of the parts to be covered and trace the outline with a pencil. Then cut out the paper slightly larger than the pencil outline and apply it to the model part. This method makes it easier

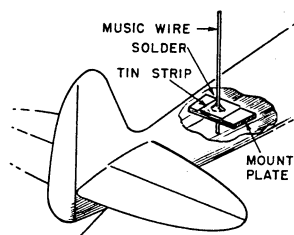


to cut out the right size piece of covering and is also more economical since odd sized scraps can be compared with the drawing before being applied to the model.—DAN LIBS, Ulysses, Kansas.

Rudder Flip-Over Insurance

● To prevent damaging the rudder on your control-liner in those flip-over landings, try this wrinkle:

Make a guard of 1/16" music wire and mount securely in the rear portion of the fuselage. Wire should extend at least one inch above top of rudder.

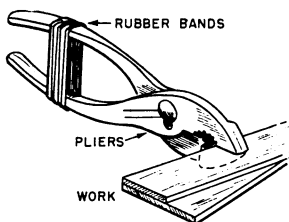


Solder the wire into a 1" square strip of tin and liberally cement to a strip of hardwood or ¼" plywood. Cement assembly securely into fuselage structure.

This guard looks like a radio antenna mast and will take the shock in the event of a flip-over.—E. J. SAUNDERS, Toronto, Canada.

Clamp Substitute

● When it is necessary to clamp two parts of your model structure together to let cement dry, this trick will help if you don't happen to have "C" clamps in your tool box:



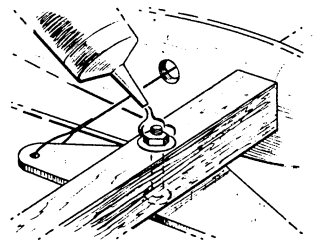
Wrap the handles of your pliers tightly with rubber bands—then pull jaws open and slip the work in. The rubber bands will hold the jaws onto the work until the cement dries.—GRADY LEE WALKER, Ninety Six, S. C.

Securing Nuts

● Your model cement can be used for other things besides sticking balsa wood together.

Where a nut and bolt is used to mount some accessory or hardware part permanently on your model in a place which will be inaccessible when structure is finished, spread a liberal blob of cement over the nut and the nearby wood. This will prevent the nut from working loose from engine vibration.

This works well on control-plate pivot bolts, landing gear "J" or eye bolts, and

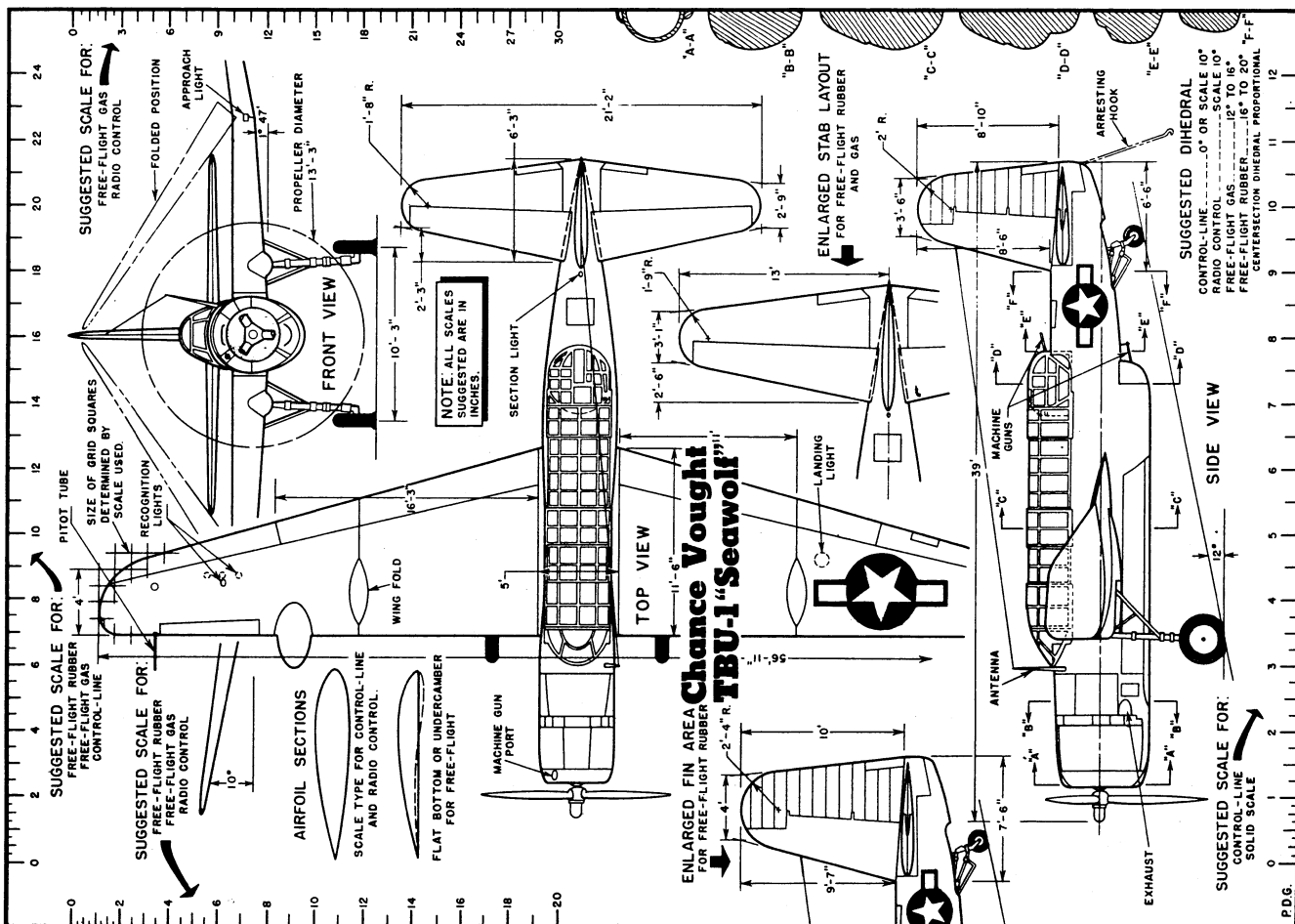


can be used on engine mount nuts if the nuts are surrounded with Plastic Wood packed down well. Cement under and over the Plastic Wood.

Always mount nuts and bolts with flat washers and either lock or star (radio) washers. Then the cement will act as a good "safety".—BILLY WRIGHT, Jackson, Miss.

Tight Mount

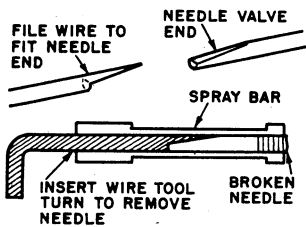
A large automobile-type star washer placed against the firewall behind an Infant or Torp Jr. engine will prevent the engine from slipping in its mount ring.—JIM RUSSELL, Lansing, Mich.



HANDY HINTS

Needle Valve Extractor

The next time a tapered-shank needle valve breaks in one of your engines try this method of removing the broken piece. File a piece of piano wire to match the taper of the needle



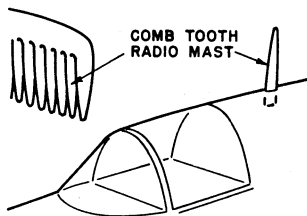
valve end. The wire should have the same diameter as the needle valve. Insert the tool from the nozzle side of the spray bar and turn the broken needle out of the spray bar. LEE HOWER, Tamaqua, Penna.

Tissue Shrinker

To water-shrink tissue covering, use a small soft sponge and rub gently over the tissue to apply water. THERRON TAYLOR, Baker, Okla.

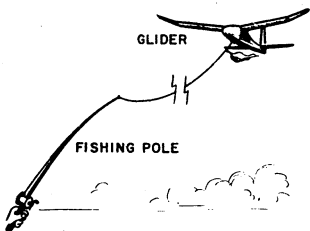
Dummy Radio Mast

Pocket comb teeth make neat radio masts for scale models. Break a tooth



Flying Fish

Towline gliders can be launched neatly with the aid of a light fishing pole. This is not allowed in competition, but

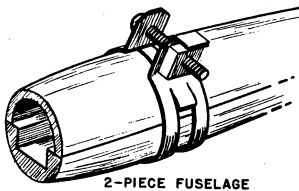


is handy for sport flying. The rod can be used to help guide the glider on tow, and the reel makes it easy to wind up the line when flying is over, and to store the line when it's not in use.—RICHARD CONDE, Providence, R. I.

Circular Clamps

Two-piece solid or speed models with circular cross-sections are often hard

HOSE CLAMP

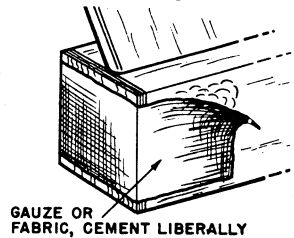


to join while carving or cementing them together. To hold this type of work firmly, simply use an ordinary automobile or aircraft hose clamp. These clamps come in various sizes and the screw adjustment allows any desired tension, as well as considerable variation in diameter.—Pfc. J. LUSKER, Cherry Point, N. C.

out of comb and push into fuselage as required with cement on the end. BRIAM LEONARD, Ann Arbor, Mich.

Firewall Fastener

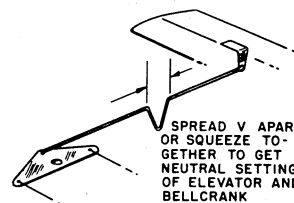
To reinforce a plywood firewall when mounting it to fuselage sides, cover the joints with gauze or aircraft



fabric coated liberally with cement. This will fuel-proof the usually oily area and will greatly strengthen the structure. RONNIE ANZALONE, Kenmore, N. Y.

Adjustable Push Rod

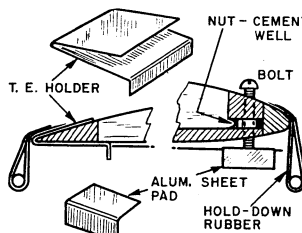
Where the elevator push-rod is mounted externally, try this kink for getting a bellcrank and elevator neutral setting: Bend a "V" in the rod at some convenient location along its



length. Bend the ends to connect to the bellcrank and elevator horn as close as possible. Then, spread the "V" apart or together as needed to get the exact setting.—BOB ELLIS, Trost, Texas.

Variable Incidence

For test-flying experiments, with various changes of wing and tail incidence, this gadget will insure careful and accurate adjustments. It can be used on

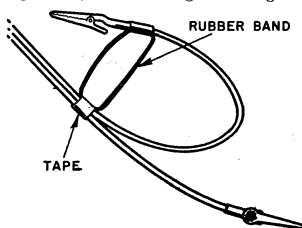


pylon or cabin-type models, and will not interfere with the knock-off rubber attachment.

A lowly nut and bolt form the basis for the idea. Two nuts are mounted firmly in the wing or tail structure, above the outer edge of the fuselage top, and the bolt is threaded through to bear against a flat plate on the pylon or fuselage top. Then, simply screw the bolt in or out to raise or lower the leading edge. The rubber bands hold the surface in place against the adjustment.—BOB LARSON, Erie, Pa.

No Shorts

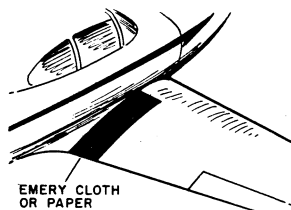
Keeping booster clips apart to prevent shorting out the batteries is always a problem, with either ignition or glow-



plug operation. Usually, when the engine is started and the booster clips are

Wing Walks

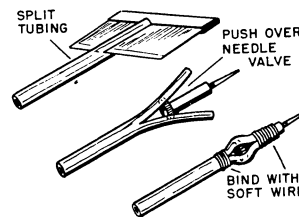
For the scale model fan, here is something to help add realistic detail: The wing walks on full-scale aircraft are usually coated with some sort of grit to aid footholds when climbing on the curved surfaces. This rough surface can be simulated on your model by using



emery cloth or fine sandpaper having black coloring. Cut out the paper to the shape needed and cement down.—PETER DANZO, Union City, N. J.

Needle Valve Extension

The tiny needle valves on 1/2A engines are sometimes hard to get at for adjustment when the prop is turning. A simple extension can be made that will help solve this problem. Split the end of a piece of neoprene tubing for

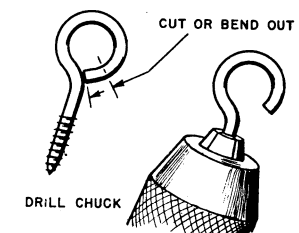


about 3/8" and slip the split end over the needle valve knob. Tightly wrap the split ends with soft wire around the needle valve body as shown. Leave

removed, they drop to the ground across each other (It'll happen darn near every time!). To prevent this, try taping or tying a rubber band on one lead as shown. This will keep the clips away from each other when not in use.—JOE MC DUFF, Chickasha, Okla.

Rubber Winder Hook

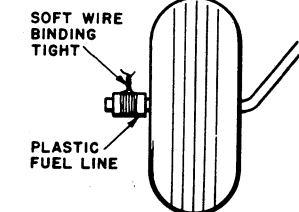
An ordinary screw eye can easily be converted into a good winder hook by



cutting out a small portion of the eye to allow attachment of rubber motor hook or prop shaft. The large diameter and threads of the screw portion will hold tightly in your hand drill chuck.—JACOB TILL, Youngstown, Ohio.

Wheel Retainers

The battle of the wheel collars goes on! If you can't solder retaining washers on the axle, to keep wheels on the model, try this method: Cut a short

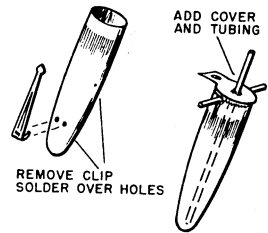


length of plastic fuel line and slip it over the axle. Bind it with a few turns

about 3/8" of tubing outside the needle valve. This can be bent back out of harm's way while tuning the engine.—EDDIE GRANT, Columbus, Ind.

1/2A Tank

Here is a fuel tank that can be used with the small engines: Obtain the metal cap from an old or cheap fountain pen or pencil. Pull the clip off, and solder up any clip mounting holes as well as the small breather hole. Drill holes for the fuel-line filler and vents,



Solder tubing in place as needed. Solder a tin disc over the open end. Mount vertically or horizontally as required. CAVIE KETCHUM, Scottsdale, Ariz.

Bottle Cap Seal

The cardboard seal in dope bottles always sticks and tears after the dope is used a few times, preventing a tight seal. Substitute a 1/16" plywood disc to overcome this.—STUART CULP, Bethany, Mo.

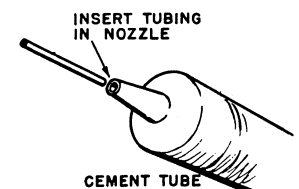
Unsticking Joints

If you cemented that joint in the wrong place, brush some dope thinner very generously on the cement. This will loosen the cement from the wood. Also apply thinner or nail-polish remover around the lids of those hard-to-open dope bottles (Turn bottle upside down). This will loosen the hard dope and make for easier opening.—D. Olson, Mora, Minn.

of soft wire to anchor it in place. JACK WHITEHOUSE, Dawson, Canada.

Cement Gun

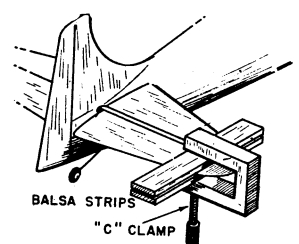
How often have you wanted a longer nozzle on your tube of cement? Here's an answer: Drill out the cement tube nozzle to fit a 1" or 2" length of 1/16 i.d. brass or aluminum tubing. Push the



tubing into cement tube nozzle and squeeze the nozzle with pliers. Plug with a pin or brad when not in use. DEAN BARBER, Wyaconda, Mo.

Aligning Elevators

Here is an easy way to make sure that the elevators of your control-line model are set in neutral when installing the control mechanism:

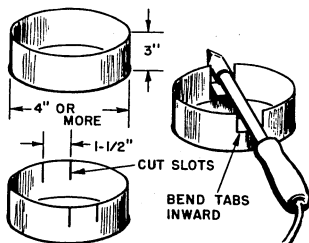


Sandwich the elevators and stabilizer between two pieces of hard balsa and hold firmly together with a "C" clamp as shown.—E. FITZSIMMONS, New York, N. Y.

HANDY HINTS

Soldering-Iron Stand

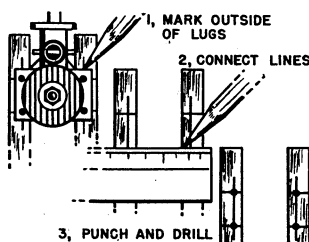
Finding a place on the workbench to lay that hot soldering iron is sometimes troublesome. Why not cut a 3" wide strip from a large tin can and then slot as



shown. Bend tabs over at right angles to the can sides to complete the holder. —GERALD THORSTON, Fort Bragg, Calif.

Spotting Engine-Mount Holes

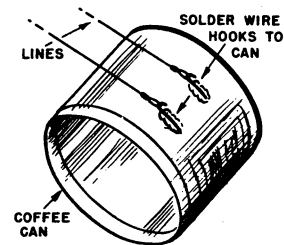
To locate engine mounting-bolt holes accurately on your model's engine bearers, try this simple method: Hold the engine firmly in place and mark wood at front, back and sides of mounting flange, in line with the holes. Remove



engine and connect up the lines, center-punch each spot, and drill to the size of the bolt. —WILSON W. ELLIOTT, Waynesville, N. C.

Line Reel

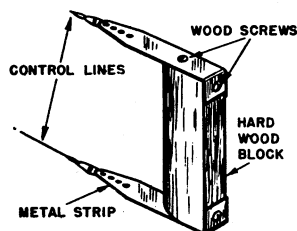
A good reel for your control-line wire can be made from the lowly tin can. Select a can 5" or greater in diameter (coffee cans are good, if you're still drinking that expensive commodity).



Solder two wire hooks on the side of the can as shown. Hook your wire ends over the hooks and wind the wire onto the can. A rubber band hooked through the other wire ends and pulled around the hooks will keep wires from unreeling. —ROBERT SHIVAK, Stockholm, Sask., Canada.

Home-Made Handle

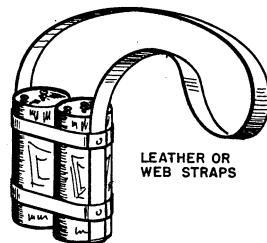
In an emergency, a strong and simple control-line handle can be made of readily available scrap material. Use any 1/4" x 2" x 4" hardwood block and shape



as shown. Make the metal strips 3/4" x 4" of 1/16" thick or greater aluminum or steel. Set wood screws in cement for

Battery Carrier

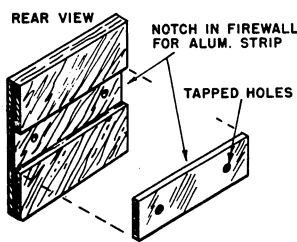
Here is a simple way to carry booster batteries in the field. An old belt, or a leather or cloth webbing strap is run around the batteries lengthwise. Two other straps are run around the batteries and over the lengthwise strap.



This strap assembly can be riveted together into a permanent harness, or tape can be substituted for the two straps around the batteries. —Unsigned, 591 Nipissing St., North Bay, Ontario.

Stick Radial Mount

Instead of cementing engine mount nuts to the back of the firewall, or soldering nut plates, try this wrinkle:

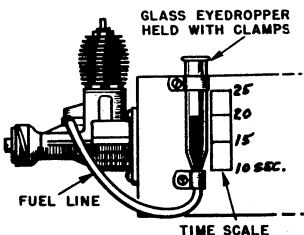


Cut a notch in your firewall large enough to hold a strip of aluminum. Then, drill and tap holes in the aluminum strip for the engine mount bolts.

a strong joint. Drill additional holes in the metal strip to allow for uneven line lengths. —B. WEDDINGTON, Wellington, Kansas.

Fuel-Tank Timer

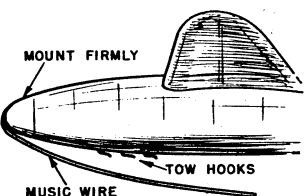
Timing a 1/4A engine run for free-flight can be tricky. Try this wrinkle for simple and accurate timing: Use an eyedropper for a fuel tank, mounted on the side of the fuselage close to the engine. By trial and error, determine the length of the engine run, and mark eye dropper accordingly. Scratch marks, on the glass or paint marks on the fuselage will serve as a scale.



To use, simply run your engine until the fuel level drops to the desired line, then launch your model. Some adjustment of the dropper, either above or below the needle valve, may be necessary to get proper rich-lean running. —R. MAZUR, Little Falls, N. Y.

Towliner Skid

Addition of a music wire skid under the nose of your towline glider will pro-



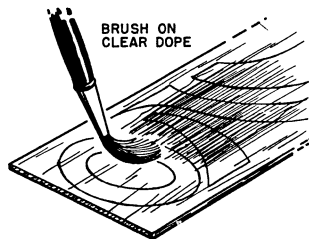
The tapped holes serve as nuts. Finally, cement the aluminum strip into the notch in the firewall and cement the firewall to the nose of the model. —MANFRED FRANK, Greenfield, Ind.

Storing Engines

To keep dust and dirt out of engines when they are not in use, wrap the engine in household aluminum foil. —TOM WEBB, JR., Fenton, Mich.

Split Preventer

When cutting odd-shaped parts out of soft balsa, the wood may have a tendency to split and tear. The wood can be strengthened by brushing a coat of clear dope on both sides of the wood.



More than one coat may be necessary on some wood. Be sure to do both sides to eliminate warping. —Charles Bral, Salt Lake City, Utah.

Balsa Filler

To smooth workbench dents and crushed spots on balsa before dopping, wet the crushed area. Water will swell the wood to its original surface as it dries. Run a warm iron over the spots to hasten drying, if desired. —BILL HUFFLING, Greensboro, N. C.

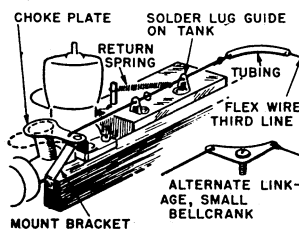
Stringer Clamp

Here's another wrinkle for holding down stringers while the cement dries:

Protect the bottom and tow hooks from landing wear and tear. The wire will also serve as nose ballast when clipped to proper length. Be sure to mount it securely in the nose and leave enough space between the wire and the bottom of your glider to allow for good shock absorption. —C. A. GRELL, Hondo, Texas.

Engine Speed Control

Glow plug engine speed control has been a toughy, but is a very desirable feature for team racing and such events. This system uses a choke plate over the intake stack actuated by a third line. The choke plate is mounted on a bracket beside the intake, a length of wire fastened to the plate runs back

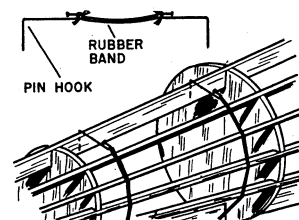


to a piece of tubing acting as a guide for flexible cable running out of the ship to the control handle.

A short coil spring moves wire and choke plate over intake, slowing engine. When cable is pulled, plate uncovers intake, permitting high speed. Coil spring acts as return pressure when cable is released.

A small bellcrank can be used in place of tubing guide and whole action can be reversed if desired. Use flexible cable for third line and make good positive action on trigger on handle. Some engines may need one or more 1/2" holes drilled in choke plate for proper low speed running. —BILL SPROUD, Escondido, Calif.

Bend two pins as shown and tie a short length of rubber band between the heads.

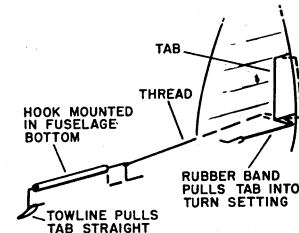


To use, just hook the pins across the stringers, stretching the rubber band so that its tension holds down the stringers being cemented. —LOYLE ERICKSON, Grantburg, Wisc.

Towliner Auto-Rudder

Towline glider launching can be tricky, but here is a gadget which will solve most of the turning problem:

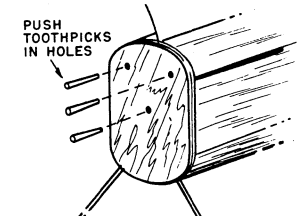
The rudder tab is pivoted and spring-loaded into the turn position. A light line runs to the tow hook, which is built as shown here. When the glider is launched, tension on the tow line



pulls the rudder tab into the straight position, allowing straight climb. When the tow line is released, the tensioner on the tab moves it to the turn position, for a circling guide. —J. P. CURTIS, Middlessex, England.

Renewing Screw Holes

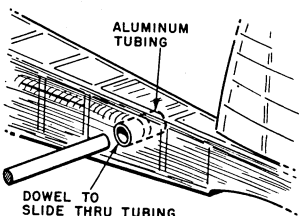
Most 1/2A engines are mounted on a plywood firewall with wood screws. After the engine is taken off and put back a few times, the screw holes become enlarged. Fuel soaking the wood doesn't help either. To correct this,



fill the holes with pieces of toothpicks set in cement, and make new screw holes through the toothpicks. —DAVID LAKE, South Pottstown, Pa.

Rubber Motor Anchor

Large rubber models can utilize this system for rear motor anchoring: Use a piece of 1/4" diameter (or larger) aluminum tubing as the rear anchor. Before winding the motor, insert a piece of dowel through the tubing.

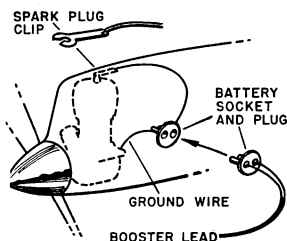


The dowel will serve as a better handle for the anchor man and will prevent the accidental tearing of the paper covering through handling. Remove the dowel after winding the motor. —R. W. DANIELSON JR., San Mateo, Calif.

HANDY HINTS

Glow-Plug Boosters

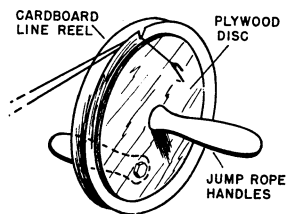
To save time and trouble with alligator clips for glow-plug starting, try wiring the glow plug and engine to a socket mounted permanently on the side of your model.



The glow-plug wire should have a regular spark plug clip, for easy removal. Booster leads from the battery are then soldered to a plug fitting the socket on the model. Use a small radio tube socket and tube plug end, or a portable radio battery plug and socket. This is a good gadget to use on team racers for fast restarting.—BILL WINTER JR., Oyster Bay, N. Y.

Line Storage

To keep control-line flying wires neat and straight, some kind of a reel is a must. So, save the cardboard reel the wires come



Contest Repair Kink

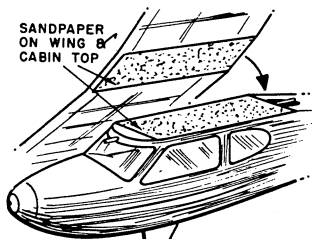
To carry dope and fuel-proofer in your tool box for on-the-spot repair work, use this trick: Obtain some empty finger-nail polish bottles, clean thoroughly with thinner, and fill them with dope, fuel-proofer, or other



needed liquids. The bottles will take up little space, and the small brushes built into the top will serve for applying the liquid. This will eliminate the need for carrying separate brushes and thinner to clean them.—PAUL KOZEL,—Freeland, Pa.

Wing Aligner

Try this method for keeping wings and tails in alignment, instead of the usual dowel or strip key arrangement.

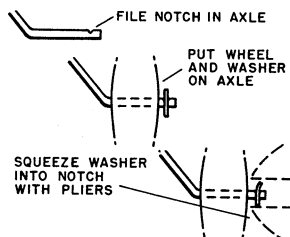


Cement fine grit sandpaper to mating surfaces of the wing and fuselage, grit side out. The friction between the two rough surfaces will prevent the

on when sold to you. With the addition of two handles, this reel can be used for line storage. Jump-rope handles or cabinet knobs can be used. You can beef up the reel with a disc of plywood or balsa cemented to one or both sides.—GENE FORBES, Fairbanks, Texas.

Wheel Retainers

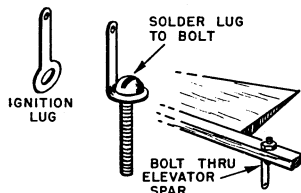
If all the methods for holding wheels on axles were laid end to end, they would reach from here to East Hattrock. Here is still another good idea to add to the pile: File a notch in the axle end, outside the wheel position. Slip a washer over the axle and squeeze it down into the notch with



pliers. Bend if needed to make a tight fit. To remove wheels, just break the washer off with pliers.—BOB KIMM, Vinton, IOWA.

Controler Elevator Horn

Solder an ignition lug to a bolt head and bend up as shown. Pass bolt through elevator and tighten nut down. Use lugs of good thickness and let the



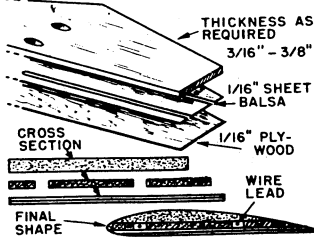
wing from shifting due to engine vibration or flight loads.—DANIEL NOVAK, Chicago, Ill.

Brush Cleaner

One usually runs out of thinner at the wrong time, with brushes still left to clean. To clean brushes adequately, scrub them out in clear dope and wipe as dry as possible. There will be some dope left in the brush, but this can be dissolved before using the brush the next time by soaking it in thinner or dope for a few minutes.—MIKE BRESSON, Alton, Ill.

Speed Wings

Control-line speed model wings must be light and strong. Try this construction method: Lay out plywood wing form and build up laminations of balsa



to the thickness desired, allowing for control leads as shown.—C. WELLS, Croydon, Pa.

Accurate Windshields

When making windshields from flat plastic sheet for cabin-type models, free-flight or control-line, follow this procedure for a neat job: From ordinary writing paper, make a pattern of the windshield to the approximate shape. Hold this in place on the model and mark it for any necessary additional trimming—then trim accordingly until a proper fit is obtained.

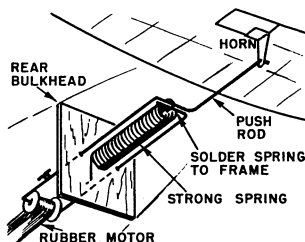
Now, wet the paper and lay it on the

Built-In Variable Trim

Changing trim from power-on to power-off flight is always quite a problem with rubber power. This gadget will compensate for the change in thrust and permit a smooth transition from power to glide.

A strong spring, pushing against the tension of the rubber motor, is used to actuate the elevator (or rudder) trim tab. The size of the spring depends upon the size of the rubber motor and can be determined easily by experiment.

Mount the rubber motor on a bobbin, as indicated. The bobbin, in turn, is mounted on a wire shaft. Bend this shaft into a simulated "U" shape, and pierce the rear bulkhead in the manner

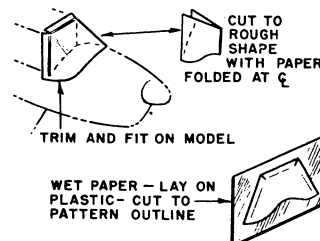


shown. Note, however, that one side of the wire frame must be cut and bent into a catch effect, to facilitate replacement of the rubber motor.

Use a large diameter compression spring, and mount this between the wire frame. Then, bending both sides of the frame towards each other, solder them to the top of the spring. One end of the frame is now cut short, while the other continues on as the pushrod. Attached to an underslung horn as shown, it will give up-elevator; mounted above the stabilizer it will produce down-elevator in the glide.

When the rubber is fully wound, the spring will be compressed and the elevator trim set for best climb under power. As the tension on the rubber diminishes, the spring will move outward, moving the trim gradually to a

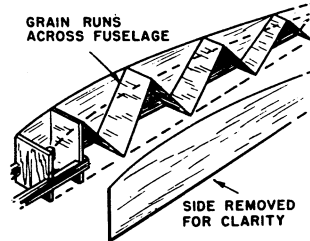
sheet plastic. The surface tension will hold the paper in place long enough to



cut out the plastic to the paper outline. Then pull off the paper and cement windshield in place.—D. R. BASTON, Muncie, Ind.

Crush-Proof Box Fuselage

Here is a neat adaptation of the Warren truss bracing used on full-scale aircraft, as applied to free-flight fuselage



construction. This lends itself best to the smaller size models (1/2 A, A or B), where standard size wood can be used.

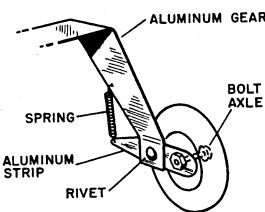
The grain of the sheets inside the fuselage should run across the fuselage. Use 1/16" sheet for a class 1/2 A and small class A models, and 3/32" sheet for large class A and B models. Assemble the fuselage from the nose to the tail. Use the "cut and try" system for getting exact taper to the internal

setting for good glide.—FRED KAUTZ, Minatare, Neb.

Shock-Absorbing Gear

Here's the added something that can change a sheet aluminum landing gear into a real shock absorber:

Instead of mounting the axle directly to the aluminum gear leg, rivet a short strip of aluminum over the axle hole. Mount the axle on the front end of this strip, and place a length of coil spring



at the rear. The spring will take the bounce out of those hard landings.—D. L. WADELL JR., Clifton Forge, Va.

Clear Plastic

When you need celluloid for windows, windshields or other parts of your model, try using old photo negatives. Soak the negatives in hot water and peel the emulsion off, leaving a clear sheet of celluloid.—EDWARD WEHRLE, Pittsburgh, Pa.

Taping Ignition Connections

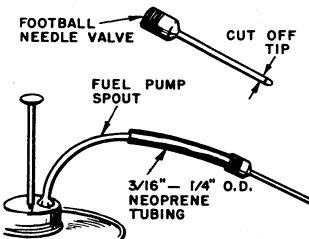
Scotch tape makes good light-weight wrapping for splices and connections in ignition circuits. It is much stickier than regular friction tape and it's transparent—you can check connections without removing the wrap.

Try binding the hi-tension lead to the spark coil to insure a tight connection when the coil is mounted in some hidden, hard-to-get-at location in the model structure. Do not use the tape in the vicinity of the fuel or engine.—EDDIE KENNEDY, Short Hills, N. J.

sheets. The extra effort will pay off with a very strong fuselage structure. A flat version of this type of construction could also be used for thick control-line wings, sliding the ribs over the box.—BOB PILLIGOR, Kenosha, Wis.

Baby Engine Tank Filler

Filling the small gas tanks of 1/2 A engines requires eye-dropper techniques. The filler pipe illustrated takes care of the problem neatly, and can also be used



for priming, where single drops of fuel are put into intakes or cylinders.

Obtain a needle valve of the type used for inflating footballs or basketballs having a rubber valve on the bladder. If the needle has a blunt end with holes on the side walls of the tube, cut off at the holes and file off any burrs. A length of 3/16" or 1/4" O.D. neoprene tubing is forced into the threaded end of the needle valve. The tubing then is pushed onto the fuel pump spout as shown.—JOE KISH, Zeigler, Ill.

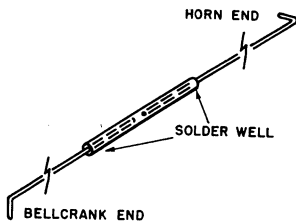
Pickled Engines

Still another household product is handy for storing your pet engine when not in use: Wrap the engine in several layers of "Saran-Wrap." This will seal it completely against dust and moisture. Put a couple of rubber bands around the wrap to hold it in place.—AL PRIVEN, Jericho, N. Y.

Adjusting Pushrod Length

How many times have you bent the ends of a pushrod, only to have the length come out wrong so that "neutral" at the bell crank came out full "down" at the elevators? Well, this simple trick will change all that:

Make the pushrod in two pieces. Bend the ends to fit the bellcrank and

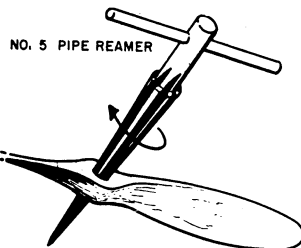


elevator horn, then trim the middle ends so that they almost touch. Make this break between two formers, so that there is room to work in. Then slide a length of brass tubing over the rod ends and solder well. Hold the bellcrank and elevators in neutral position while you center the tubing over the break in the rods.—BOB WADSWORTH, Erlanger, Kentucky

Prop Shaft Holes

Modellers using engines with large crankshafts or prop-spinner adapter nuts (such as the McCoy's and Ohlsson "60") generally have a little trouble at one time or other in making the shaft hole on the prop fit easily and accurately. Of course modellers having a drill press can easily solve this problem, but some of us are not so fortunate.

Try using a tapered pipe reamer, preferably with a "T" handle, obtainable from your local hardware store. The No. 5 pipe reamer will give diameters from $\frac{1}{8}$ " to $\frac{1}{2}$ " and is most satisfactory for enlarging shaft holes. If this hand reamer is not available, then a regular pipe reamer can be adapted by having your local machine shop drill

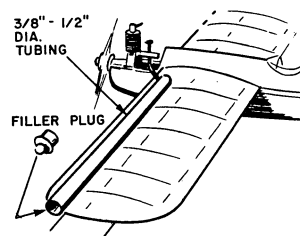


a $\frac{1}{8}$ " hole through the end which would normally fit into the drill press. Then you can easily press a rod of $\frac{1}{8}$ " diameter steel into this hole to serve as a handle. The reamer will save a lot of sore hands and tempers.—HOWARD LAMBERT, Lewiston, Maine.

Another Stunt Tank

Thin-walled brass or copper tubing of $\frac{3}{8}$ " or $\frac{1}{2}$ " inside diameter forms this control-line stunt-model tank which is mounted inside the wing leading edges. The outboard end has a simple plug for filling. Centrifugal force keeps fuel flow constant.

Running time for a 2 cc. diesel is about five minutes per foot of $\frac{3}{8}$ " diameter tubing (2 cc. is equal to .12 cubic



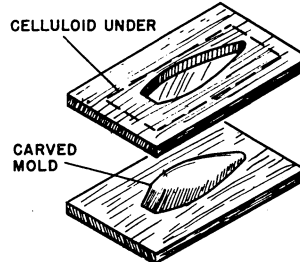
inches). The opposite wing tip should be drilled to balance the model laterally.—ROLAND COTT, St. Helens, England

Clean Cowling

To retain a smooth top on speedliner cowlings, and to eliminate the need for a hole for glow-plug access, simply do this: Solder a short length of wire to the top of the glow plug and let it extend out the rear cowling vent about $\frac{1}{2}$ ". Attach booster clip here for starting.—BRAD PURINTON, Wagon, La.

Bubble Canopy

If you can't find a bubble canopy of the right size for that pet model, try making your own this way: Carve a wooden mold to the proper size and

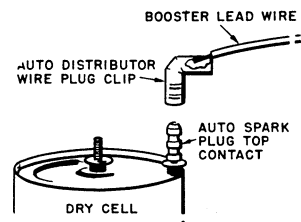


shape. Make the mold as smooth as possible, because any roughness on the mold will be transferred to the molded plastic bubble. Mount the mold on a flat piece of wood.

Then, take another piece of wood and cut out to the mold. The celluloid is fastened to this board with thumbtacks. Apply heat until the plastic becomes soft (Do Not Use An Open Flame!), press down over the mold, and hold until the plastic cools.—DONALD BLOUCH, Cleona, Pennsylvania.

Battery Connectors

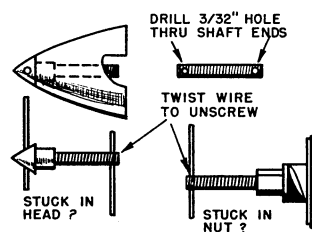
When changing from parallel to series circuit or adding fresh batteries try this wrinkle. Take top contact screws off old auto spark plugs and put them on post of dry cells. (Plug contacts have same thread as No. 6 cells.) The ends of booster leads have auto



spark plug clips from distributor wire soldered to them. The leads can be quickly changed or batteries replaced. Always pull leads off batteries when putting away to avoid shorting at clip ends.—JOHN TATUM, Van Nuys, Calif.

Removing Extension Shafts

Some modelers may have had trouble removing Froom extension shafts from the spinner head or prop shaft nut. Using pliers, of course, does not do the threads any good! Instead, drill holes through the ends of the shaft. Then, when the shaft is screwed down tight, it can be unscrewed by inserting a length of wire through the hole and



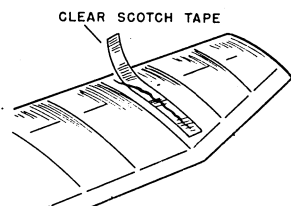
twisting the shaft off in the same manner that the spinner head itself is removed.—HOWARD E. SMITH, Augusta Flying Maniacs, Augusta, Me.

ENGINE CLEANER

When your model bites the dust and the engine becomes packed with dirt, try using "Gunk" to clean it thoroughly. "Gunk" is the trade name of a product used to clean aircraft and automobile engines, generally available at motorcycle or auto supply stores. "Bendix Metal Cleaner" is a similar product that will do the job. Be sure to remove all cleaner before reusing engine. Apply light oil after cleaning.—DICKIE NORTHUM, Fort Smith, Ark.

Patching Paper Covering

Minor tears and splits in paper covering on your model can be quickly patched with clear Scotch Tape. This is particularly



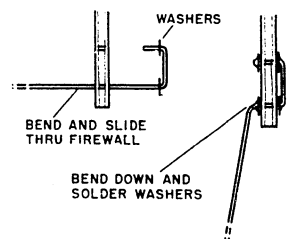
handy when flying at a contest, and saves time and trouble fiddling with dope and paper.—JOSEPH MESSING, Lancaster, New York.

Drill Substitute

For those modelers who do not have access to the small drills used for motor mount holes, here is a simple substitute: Take a nail, the same size or a little smaller than the mounting bolt to be used, heat it red hot, and push it through the firewall where the hole is to be. This method will work on most plywood firewalls and it will make as clean a hole as a drill.—JERRY NORDINE, Litchfield, Minn.

Landing Gear Kinks

A sturdy one-wheel landing gear for rubber and light gas models can be



made as shown. Drill holes in your plywood firewall or former and bend the wire. Then slide the wire through the plywood, make bends in lower portion, and solder washers.—DANNY LUTZ, Los Angeles, Calif.

Bending Balsa

Balsa-covered model structures requiring planking can sometimes be built quicker if sheet balsa is used. Structures such as straight-tapered tail cones can be done in this way. Sharp bends in sheet are best done by soaking the balsa five to ten minutes in hot water, then forming in position. Bind with gauze bandage or rubber bands until wood dries. Remove binding, then cement in place.—DAVID COOK, Harmon, Va.

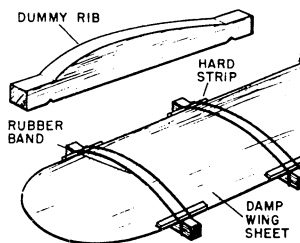
Sizing It Up

If in doubt about a certain wire diameter, try this gizmo: Use a spark plug gauge of the type having wires of various sizes. Just compare the unknown wire with the gauge wire to find the

size. The gauge is also a handy addition to your tool kit if you are running ignition engines. Use it for its original purpose of setting spark-plug-point gaps.—MORRIS E. CORNELIUS, Yale, Iowa.

Cambering Sheet Wings

The $\frac{1}{2}$ A engines lend themselves ideally to sheet balsa airplanes. Curving sheet wings to a good airfoil shape can be accomplished using the method shown. Cut out and sand the top of scrap $\frac{1}{4}$ " or $\frac{3}{8}$ " sheet to the desired airfoil shape, notching it slightly on the bottom at the front and the rear. Cut enough of these dummy ribs to space



out at about 3" intervals on one wing panel. Dampen the wing sheet and lay it over the dummy ribs, clamping it with rubber bands. Slip a strip of hard $\frac{1}{4}$ " x $\frac{1}{4}$ " balsa under the rubber band along the leading and trailing edge to keep the rubber band from cutting into the wing sheet.

As the wood dries, apply a ribbon of cement chordwise next to, but not touching, the dummy ribs on the underside of the wing. The cement shrinkage will help set curve. Pick your wing panels from the same or very similar sheets so there will be little difference in grain, weight and stiffness. When dry, the dummy ribs can be removed and used to duplicate this procedure for the other wing panel.—EDWARD HECKER, Indianapolis, Ind.

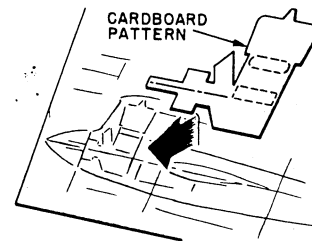
Take-Off Ramp

If your control-line site has rough ground or high grass, get a large cardboard carton, cut through on one corner and open it up to lie flat on the ground. This will form a smooth strip for takeoffs of small airplanes needing only a short runway.—HUBBARD VOLENICK, Baltimore, Md.

Designer's Engine Pattern

● If you do your own model designing or enlarge magazine plans, you will find a full-size pattern of your engine (or engines) very helpful when laying out the engine installation.

Cut the pattern out of a stiff piece of cardboard and give it several coats



of dope to strengthen the edges. Mark the mounting lug position on the pattern. Front and top-view patterns may also prove helpful.—JOE W. WRIGHT, Gormley, Ont., Canada

Hot Pilots

The dummy pilot *vogue* is a good one, but why is the little fellow always installed so that he stares woodenly ahead like a real "dummy"? If space permits, try installing him in a slightly turned position and he appears to glance intelligently over the side of the cockpit—to the delight of surprised onlookers.—DON ANTONELLI, Brooklyn, N. Y.

FM DATA SHEETS

MODEL BUILDING MATERIALS

<p>SHEET BALSA</p> <p>WING RIBS LEADING EDGES CAP STRIPS</p>	<p>PLYWOOD</p> <p>FUSELAGE SIDES, TOPS, BOTTOMS DIHEDRAL GUSSETS</p>	<p>BLOCK BALSA</p> <p>FIREWALLS GUSSETS WING FOOT FAIRING WINGTIPS</p>	<p>BAMBOO</p> <p>STABILIZER OUTLINES WINGTIP OUTLINES REED</p>	<p>RUBBER TUBING</p> <p>COCKPIT COMBING WINDING HOOK SLEEVE FUEL LINES WHEEL HOLD-ONS SCALE TIRES</p>
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BOB COON

USED FOR

MATERIAL

<p>EXPANDED POLYSTYRENE</p> <p>FLOATS WINGTIPS DECKING</p>	<p>SHEET DURAL</p> <p>MOTORMOUNTS LANDING GEARS</p>	<p>PIANO WIRE</p> <p>SKIDS PUSHRODS F/F R/C LANDING GEAR</p>	<p>FIBRE GLASS</p> <p>SHELL WINGTIPS WHEEL PANTS COWLINGS BEEFING UP NOSE SECTION</p>	<p>SHEET ACETATE</p> <p>WINDSHIELDS CANOPIES</p>	<p>COTTON CLOTH</p> <p>DIHEDRAL RE-INFORCEMENT HINGES BOB COON</p>
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PINKING SHEARS

BOB COON

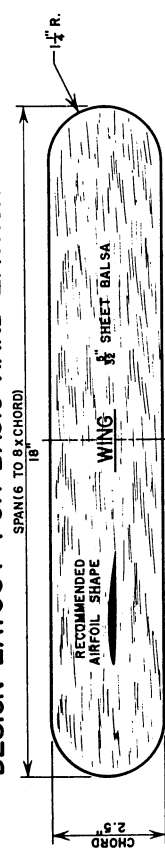
BUILDING, FLYING AND ADJUSTING

CONCLUSION: THIS IS THE FIRST OF A SERIES OF ILLUSTRATED DATA SHEETS, DESIGNED TO BETTER ACQUAINT NEW MODELERS WITH VARIOUS DESIGN, CONSTRUCTION AND OTHER ASPECTS OF THE HOBBY. KEEP THIS INFORMATION HANDY FOR YOUR OWN REFERENCE, AS WELL AS YOUNGER BILLY BEES IN YOUR NEIGHBORHOOD.

FM DESIGN SHEETS

BASIC GLIDER DESIGN

DESIGN LAYOUT FOR BASIC HAND-LAUNCH GLIDER



WING AREA: To determine the amount of wing area, multiply the span by the chord; then subtract the area removed in making the semi-circular tips (Area of half-circle is determined by multiplying the radius by the radius and then by 1.57). An airfoil shape similar to the one shown above is recommended, as it will obtain in achieving excellent results with maximum stability.

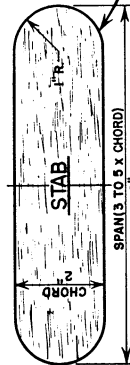
WING SIZE: Select a span and chord which will give a wing size from 30 to 50 square inches in area. The span should be six to eight times the length of the chord; the approximate thickness of the wing airfoil, 1/16" to each 1" of chord.



DIHEDRAL
1 1/2" TO 2" / FT.

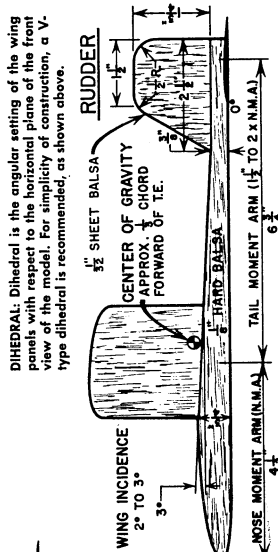
FUSELAGE LENGTH: The fuselage length—the total length of the model from the nose to the trailing edge of the stab or rudder, whichever is farther from the nose—should be approximately from three-quarters to the same length as the wingspan. The maximum fuselage depth should be no more than one-third the wing chord, but maximum fuselage thickness should not exceed one-quarter of the fuselage depth.

MOMENT ARMS: The distance between the centerline of the wing and the centerline of the stab is known as the Tail Moment Arm. This should be one and one-half to twice the length of the wing and the distance between the centerline of the wing and the nose of the fuselage, with the length of both moment arms equaling the fuselage length between the nose of the fuselage and the centerline of the stabilizer.



STAB AREA: The size of the stabilizer should range from 35% to 45% of the wing area. Also note that if the tail moment arm selected closely approximates the minimum suggested, then use maximum suggested, then use a small stab area.

ADJUSTING TECHNIQUE: Add ballast in the form of clay to the nose of the fuselage until a glide is obtained with a slight nose-up attitude. For right-hand launch to the right adjust for a left turn by warping the rudder to the left a little at a time until a wide circle is obtained in the glide. Make final adjustments by warping right inboard wing panel down, or, if recovery is too quick and light turn. In doing so, it may be necessary to remove some clay to compensate for the additional nose-down effect of the stab adjustments.



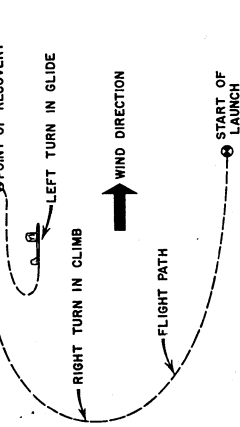
WING INCIDENCE: 2° TO 3°

STAB INCIDENCE: -1° TO 0°

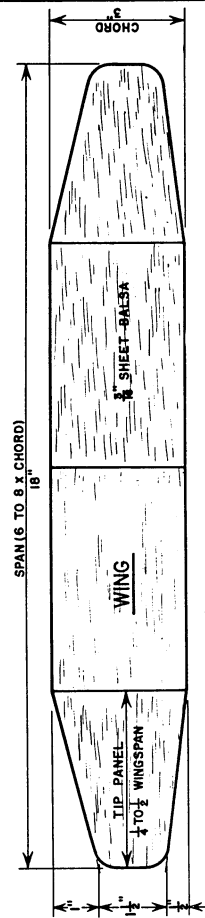
INCIDENCE: Incidence refers to the fixed angle at which the wing or stab is set with reference to the horizontal reference line of the fuselage side view (see drawing). For a basic hand-launch glider, wing incidence should be 2° to 3°; for a single rudder, 12% to 13%; for double rudder, 12% to 16%.

CENTER OF GRAVITY: The point at which the model airplane is balanced about all its axes is known as the Center of Gravity. When the center of gravity is too far forward, the model will dive, and when too far to the rear, the model will stall. If you follow the proportions set forth for the correct tail and nose moment arms for this glider, the theoretical center of gravity will be located approximately one-third of the wing chord forward of the trailing edge.

POINT OF RECOVERY:



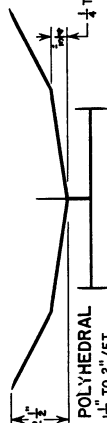
DESIGN LAYOUT FOR CONTEST HAND-LAUNCH GLIDER



WING SIZE: Select a span and chord which will give a wing area of from 40 to 60 square inches. This size is preferable if your only previous experience has been with a basic hand-launch glider. Use the same chord-to-span ratio limits as on the basic hand-launch glider. A high span-to-chord ratio is preferable on a contest glider. The thickness ratio remains the same as on the basic hand-launch glider.

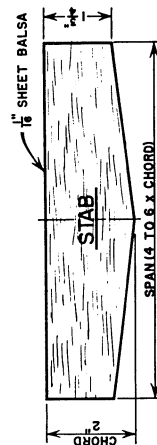
RECOMMENDED AIRFOIL SHAPES

AIRFOIL SHAPE: There are two types of airfoil shapes which can be used. The flat bottom airfoil (A) is recommended as a first design but a curved airfoil (B) can be employed if desired.

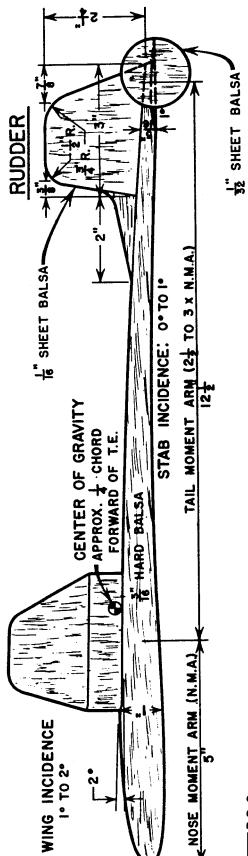


POLYHEDRAL
1 1/2" TO 2" / FT.

STAB AREA: The stab should be 30% to 40% of the wing area. If previous experience with a contest hand-launch glider is lacking, or launching ability is moderate, use a stab area which closely approximates the maximum suggested, in conjunction with the minimum suggested for the tail moment arm.



FUSELAGE LENGTH AND DEPTH: The fuselage length should be one to one and one-quarter the wing span. The maximum fuselage depth should be no more than one-third the wing chord. The maximum fuselage thickness should not exceed one-quarter of the fuselage depth.



RUDDER

1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

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1 1/2" SHEET BALSA

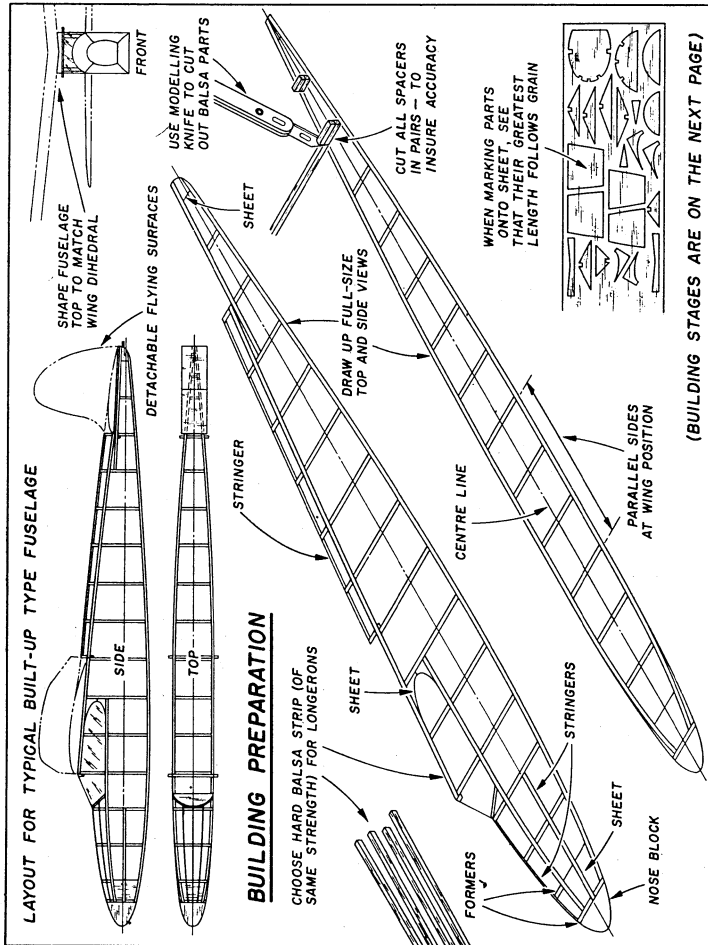
1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

1 1/2" SHEET BALSA

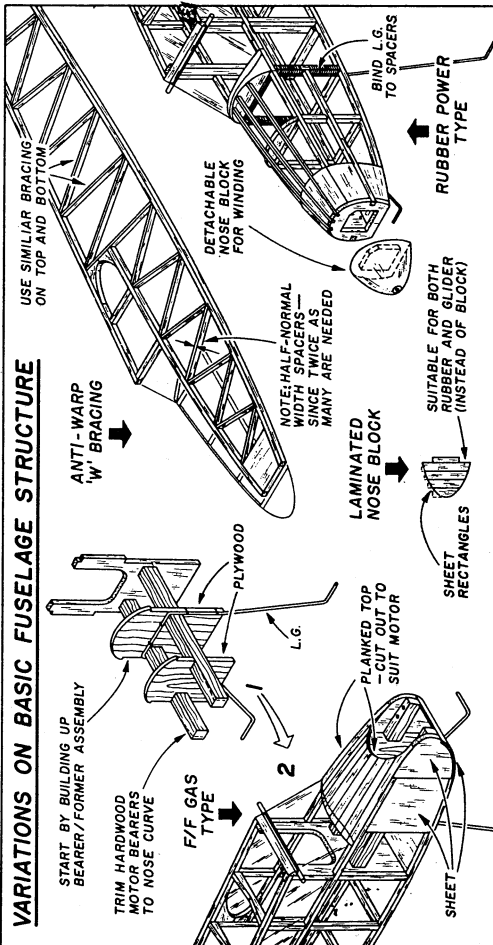
FM CONSTRUCTION SHEETS

BUILT-UP FUSELAGES

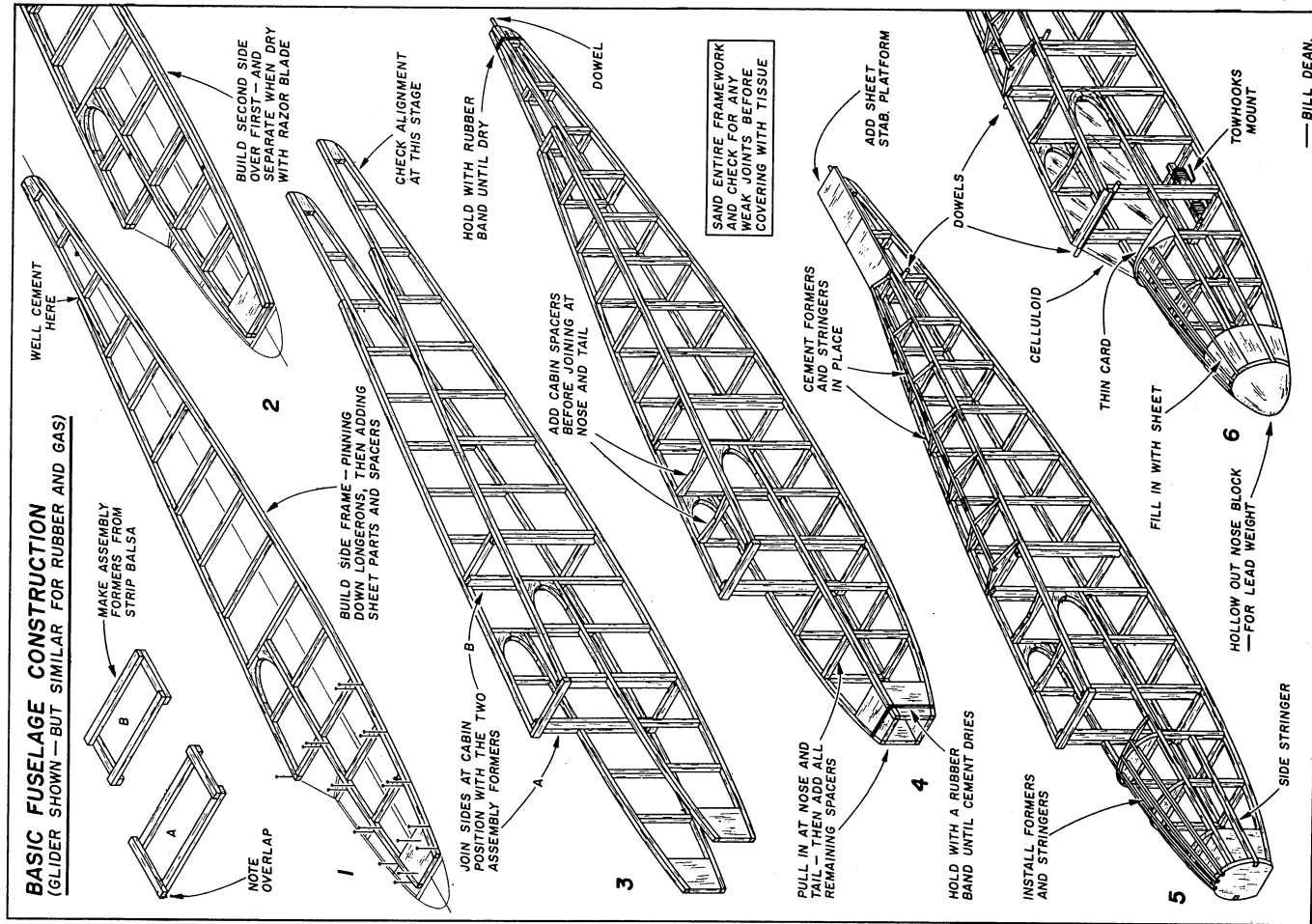


(BUILDING STAGES ARE ON THE NEXT PAGE)

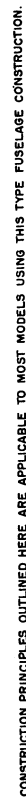
VARIATIONS ON BASIC FUSELAGE STRUCTURE



BASIC FUSELAGE CONSTRUCTION (GLIDER SHOWN - BUT SIMILAR FOR RUBBER AND GAS)



FUSELAGE CONSTRUCTION

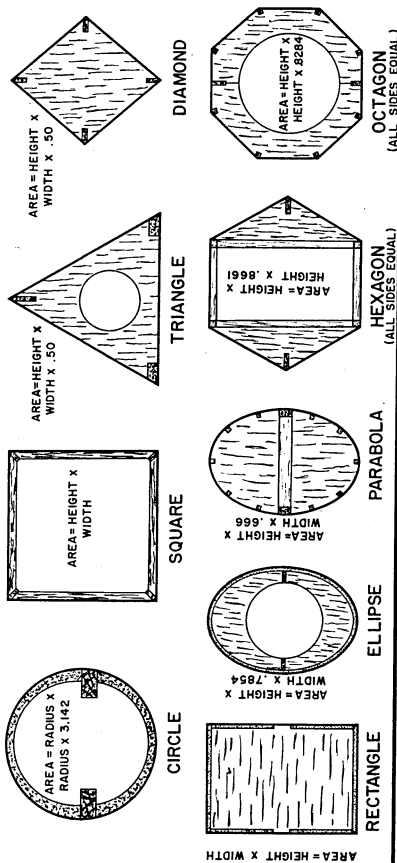


FM DESIGN SHEETS

FUSELAGE PLANFORMS

FUSELAGE AND RUDDER PLANFORMS

BASIC FUSELAGE CROSS-SECTION SHAPES:



GENERAL APPLICATIONS OF BASIC AND COMPOSITE PLANFORMS

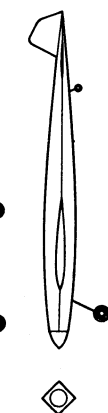
TYPICAL SPEED:



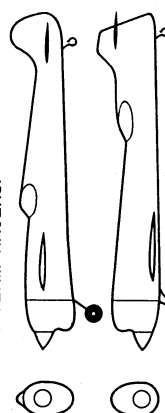
NOTE: PLANFORM AND CROSS-SECTION SHAPES SHOWN FOR THE DIFFERENT TYPES CAN BE USED INTERCHANGEABLY, MANY TIMES TO GREATER ADVANTAGE.



TYPICAL STUNT:



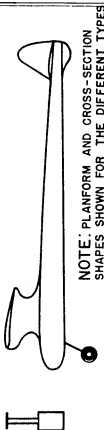
TYPICAL TEAM RACERS:



P.D.G.

FREE-FLIGHT

TYPICAL GAS:



NOTE: PLANFORM AND CROSS-SECTION SHAPES SHOWN FOR THE DIFFERENT TYPES CAN BE USED INTERCHANGEABLY, MANY TIMES TO GREATER ADVANTAGE.



TYPICAL RUBBER:

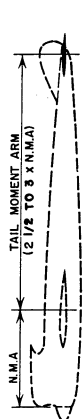


TYPICAL TOWLINE:



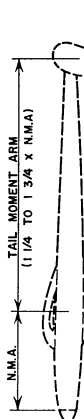
GENERAL APPLICATION OF MOMENT ARMS:

SPEED:



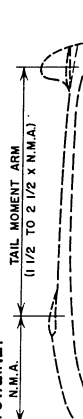
FOR MAXIMUM CONTROLLABILITY, LONG TAIL MOMENT ARM DESIRABLE. GRAVITY, GENERALLY LOCATED AROUND WING LEADING EDGE, BEARING DOWN ON WING PANELS WILL AID IN OBTAINING A MORE FORWARD CENTER OF GRAVITY LOCATION WITH MINIMUM FUSELAGE LENGTH.

RUBBER:



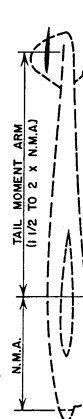
MODERATELY LONG TAIL MOMENT ARM DESIRABLE BUT NOT EASILY OBTAINED BECAUSE OF LENGTH AND WEIGHT OF RUBBER MOTOR. REAR MOTOR BEARING LOCATED WELL FORWARD OF STABILIZING SURFACES ASSISTS IN OBTAINING A MORE DESIRABLE ARRANGEMENT.

TOWLINE:



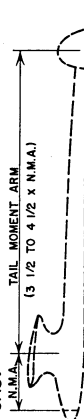
FOR LONG AND SHORT TAIL MOMENT ARMS USED, FOR EASIER CONTROL, LONG TAIL MOMENT ARM DESIRABLE. IN GUSTY WEATHER, BALLAST IS USED TO OBTAIN CORRECT CENTER OF GRAVITY LOCATION.

STUNT:



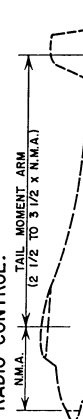
SHORT TAIL MOMENT ARM BEST FOR PROVIDING RAPID CONTROL RESPONSE AND TIGHT BUT SMOOTH MANEUVERS. CENTER OF GRAVITY GENERALLY LOCATED SLIGHTLY FORWARD OF BELLCRANK POSITION.

GAS:



LONG TAIL MOMENT BEST AND IS EASILY OBTAINED BECAUSE OF HIGH CONCENTRATION OF WEIGHT AT NOSE. CENTER OF GRAVITY, IN THIS CASE, IS IN THE PROPER POSITION FOR PARTICULAR DESIGN AND THE PROPORTIONS OF THE SURFACES.

RADIO CONTROL:

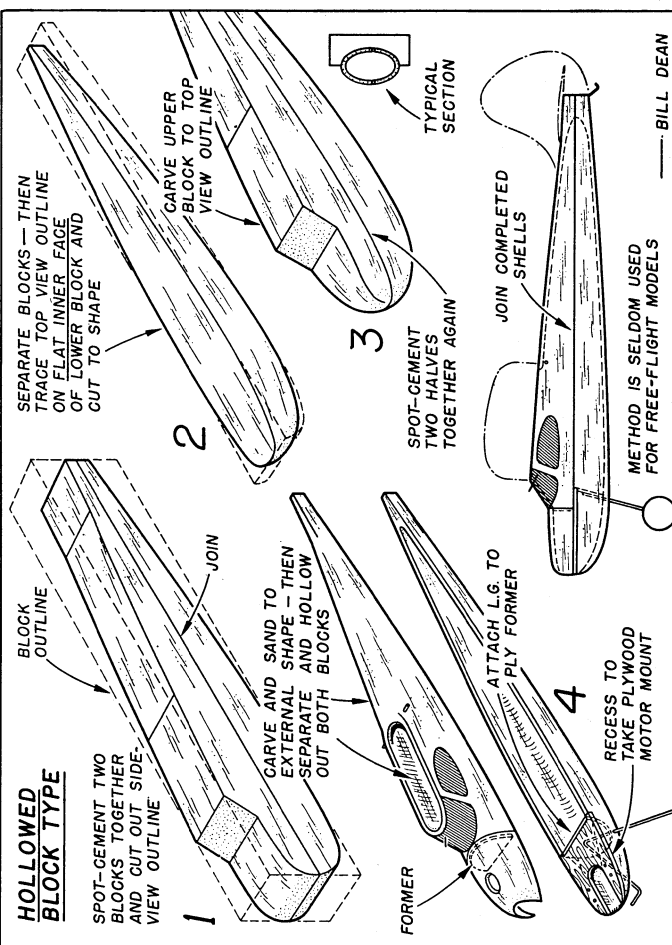
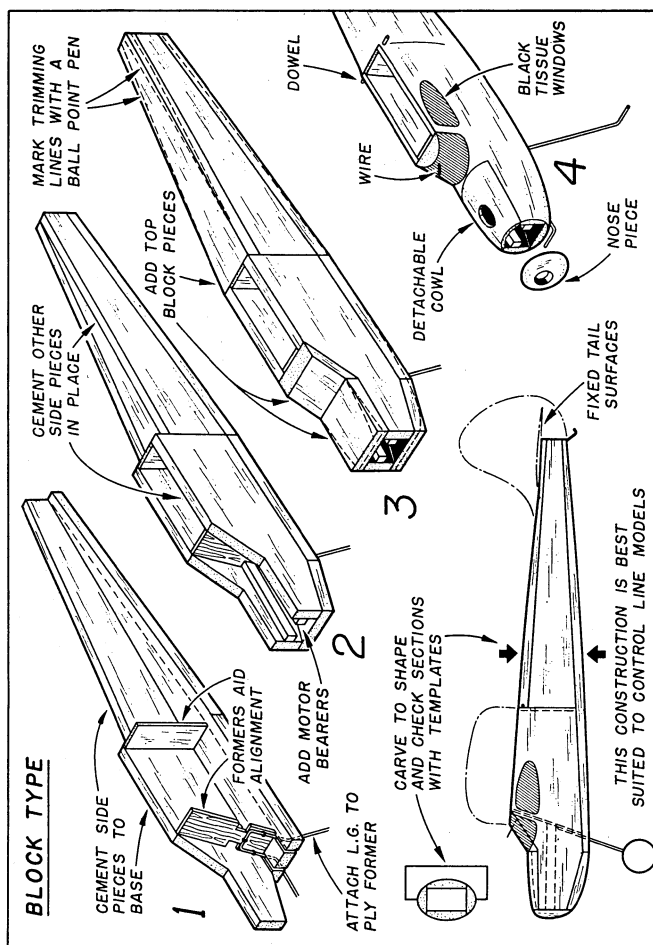
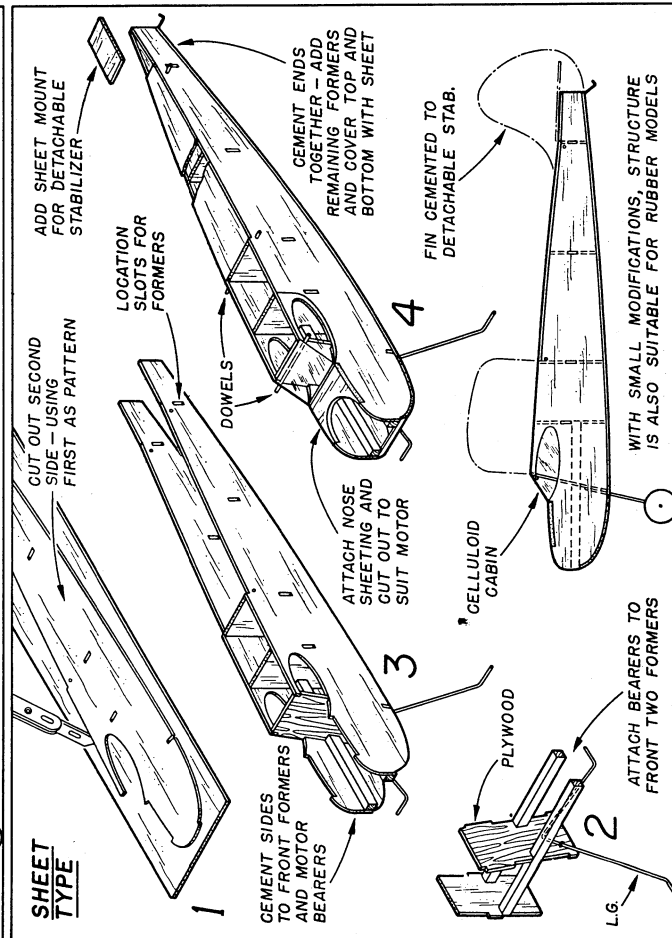
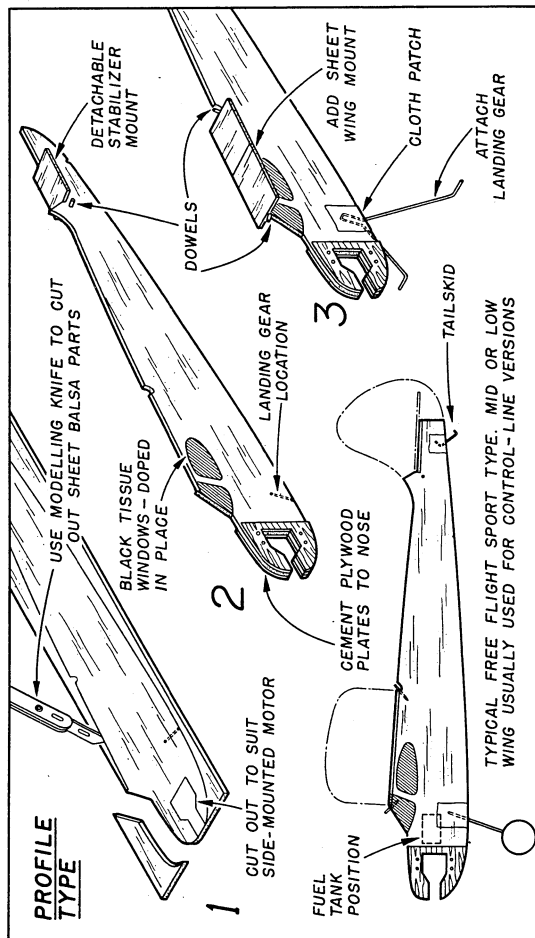


LONG TAIL MOMENT ARM COMMONLY USED, BUT NOT ESSENTIAL. CENTER OF GRAVITY GENERALLY LOCATED 1/4 TO 1/3 FROM THE NOSE. BALLAST IS USED TO OBTAIN BEST POSITION BY SHIFTING LOCATION OF THE RADIO EQUIPMENT.

P.D.G.

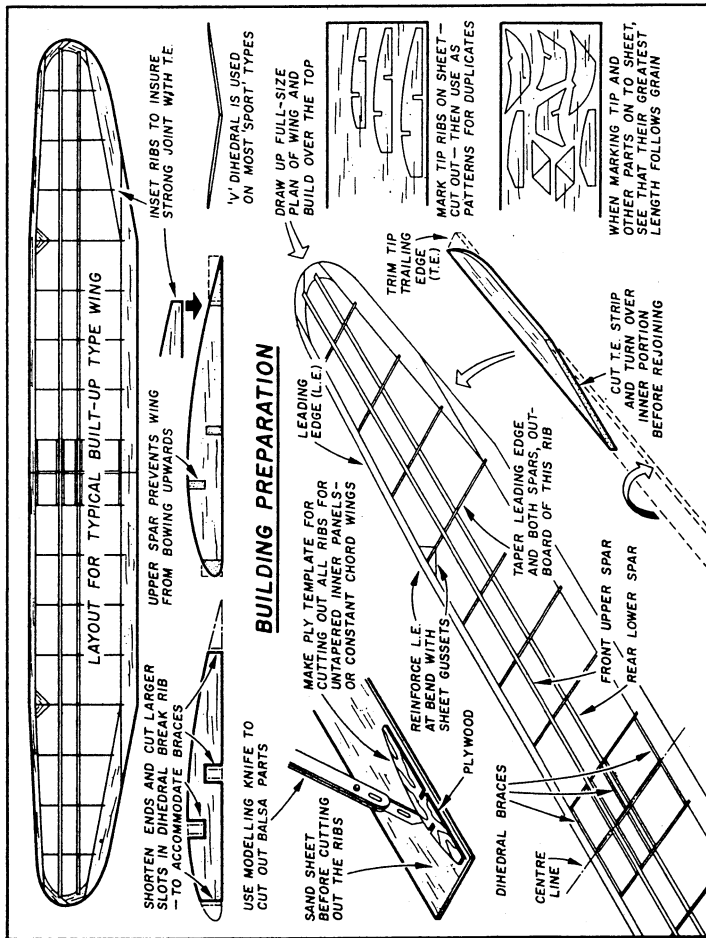
FM CONSTRUCTION SHEETS

BALSA FABRICATED FUSELAGES

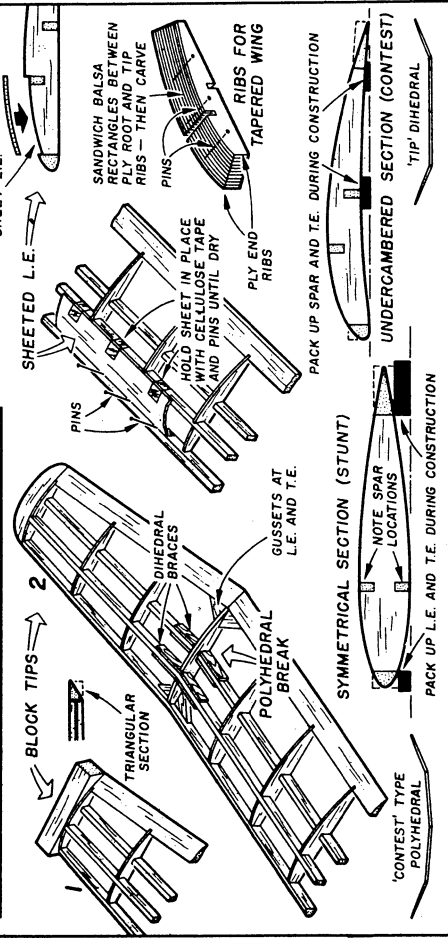


FM CONSTRUCTION SHEETS

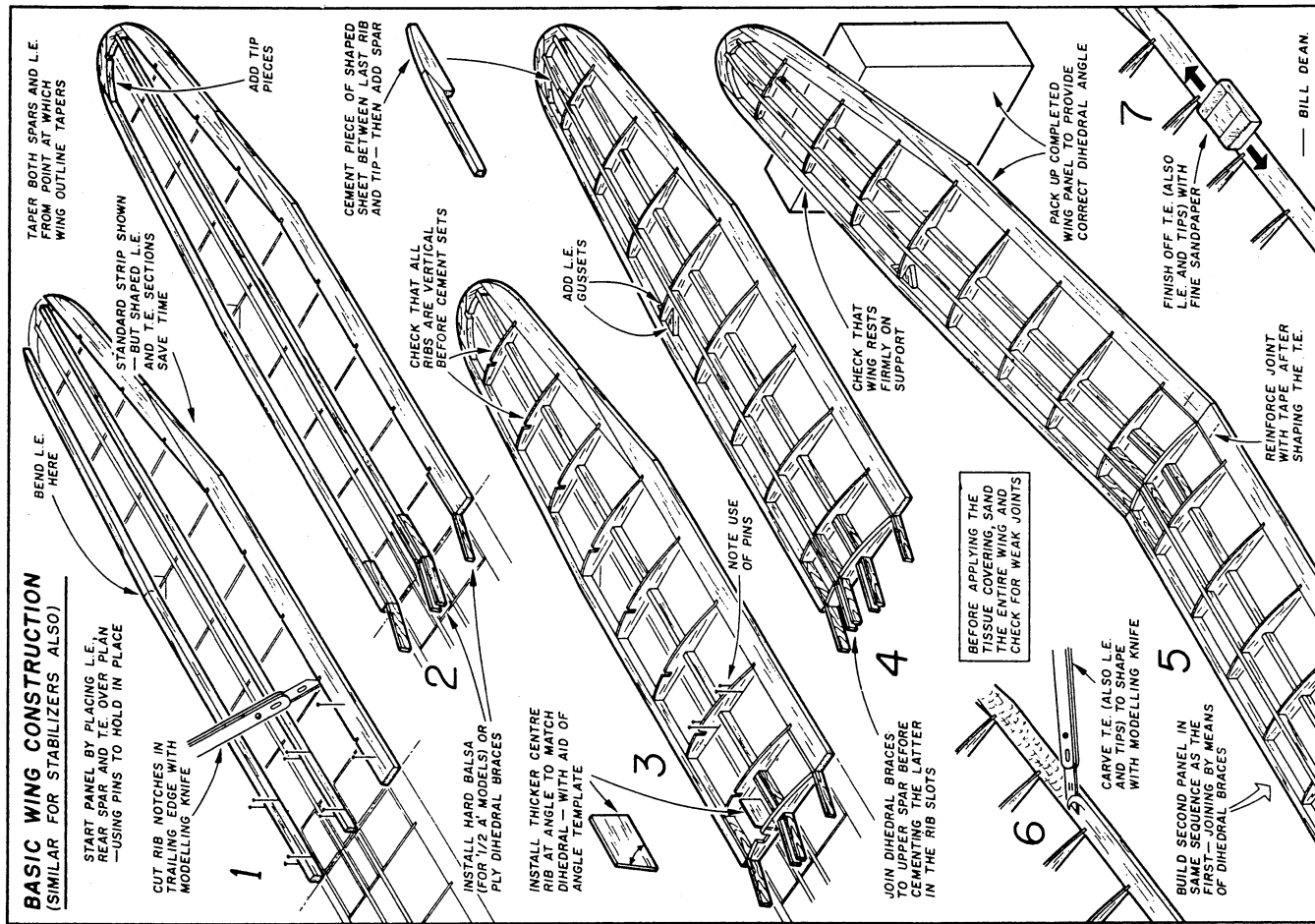
BUILT-UP WINGS



VARIATIONS ON BASIC WING STRUCTURE

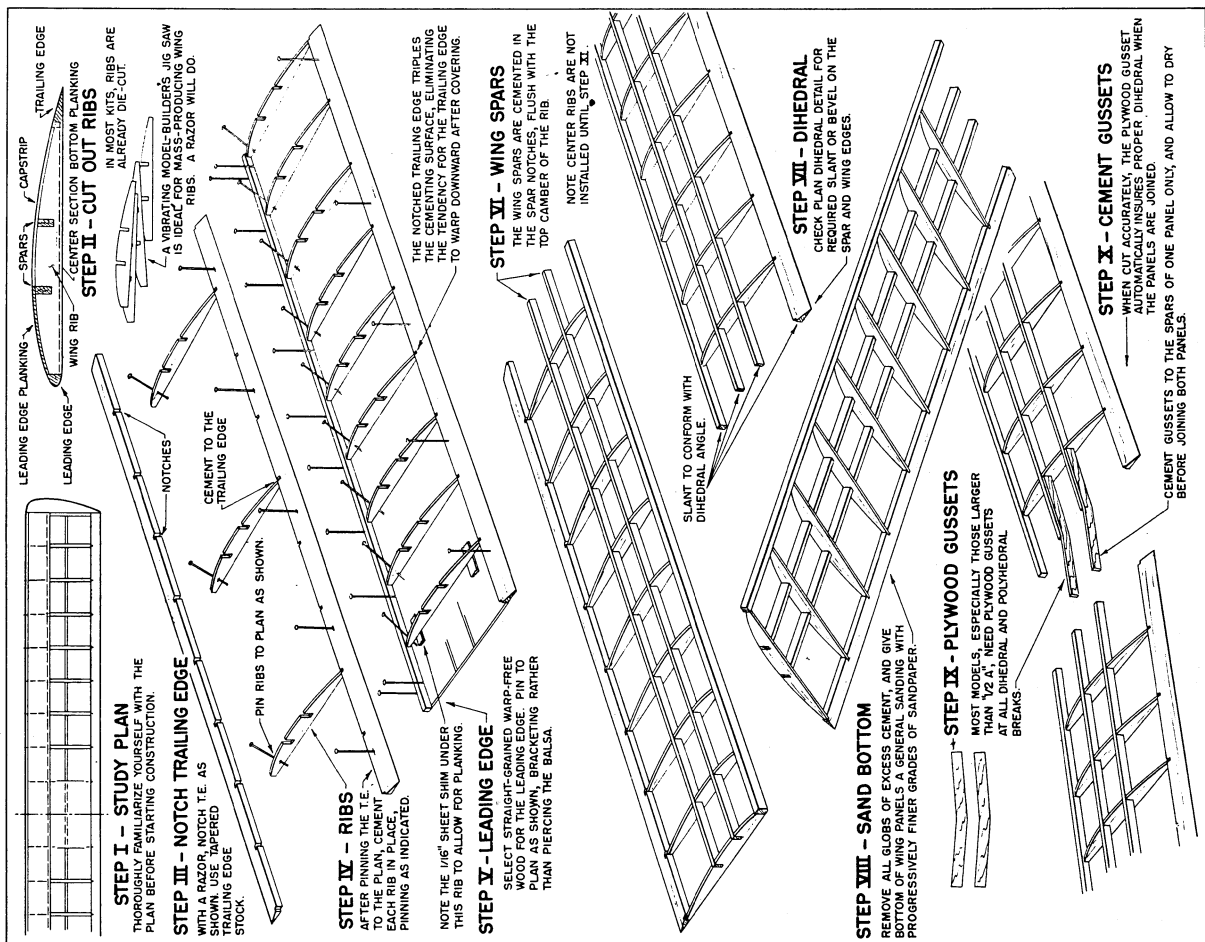


BASIC WING CONSTRUCTION (SIMILAR FOR STABILIZERS ALSO)



FM DATA SHEETS

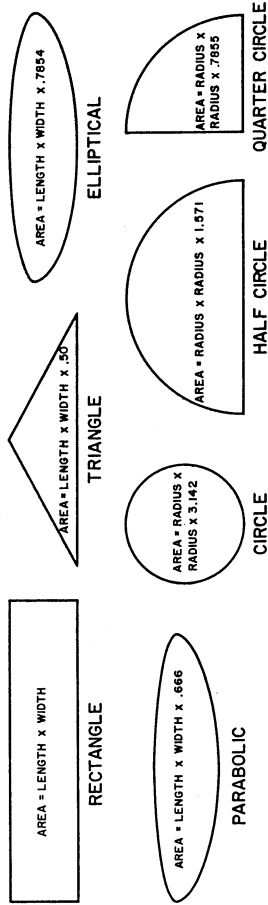
WING CONSTRUCTION



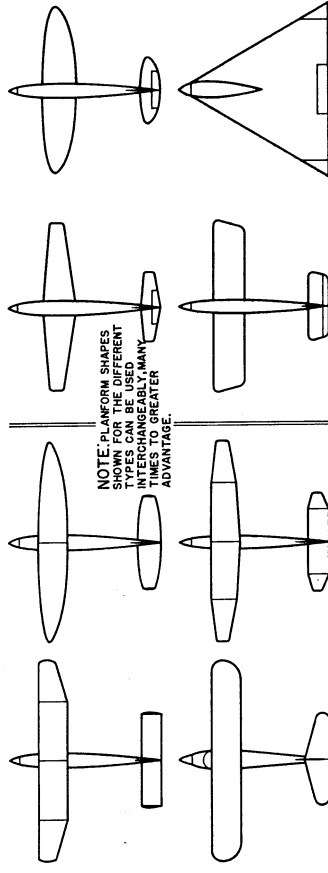
FM DESIGN SHEETS

WING AND STAB PLANFORMS

WING & STAB PLANFORMS BASIC PLANFORM SHAPES



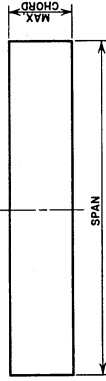
GENERAL APPLICATIONS OF BASIC & COMPOSITE PLANFORMS



NOTE: PLANFORM SHAPES SHOWN FOR THE DIFFERENT TYPES CAN BE USED INTERCHANGEABLY MANY TIMES TO GREATER ADVANTAGE.

CONSTRUCTION OF AN ELLIPTICAL PLANFORM

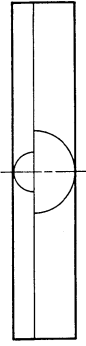
STEP ONE: CONSTRUCT RECTANGLE WHICH WILL ENCLOSE PROPOSED ELLIPTICAL PLANFORM. (MAXIMUM CHORD AND SPAN)



STEP TWO: DIVIDE RECTANGLE INTO TWO SECTIONS—ONE THIRD CHORD FOR LEADING EDGE SECTION AND TWO THIRDS CHORD FOR TRAILING EDGE SECTION. (THIS ARRANGEMENT WILL PRODUCE THE MOST POPULAR FORM OF ELLIPTICAL PLANFORM BEING USED. HOWEVER, THE SECTIONS CAN BE DIVIDED EQUALLY, REVERSED OR ALTERED IN ANY MANNER TO PRODUCE A GREAT MANY OTHER VARIATIONS OF THE ELLIPTICAL PLANFORM.)



STEP THREE: DRAW TWO HALF CIRCLE ARCS FROM POINT OF INTERSECTION OF CENTERLINE, TANGENT (TOUCHING) TO THE LEADING AND TRAILING EDGES RESPECTIVELY.

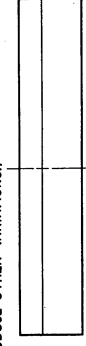


CONSTRUCTION OF A PARABOLIC PLANFORM

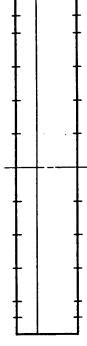
STEP ONE: CONSTRUCT RECTANGLE WHICH WILL ENCLOSE PROPOSED PARABOLIC PLANFORM. (MAXIMUM CHORD AND SPAN)



STEP TWO: DIVIDE RECTANGLE INTO TWO SECTIONS—ONE THIRD CHORD FOR LEADING EDGE SECTION AND TWO THIRDS CHORD FOR TRAILING EDGE SECTION. (MOST POPULAR ARRANGEMENT AS IN ELLIPTICAL PLANFORM—CAN ALSO BE ALTERED TO PRODUCE OTHER VARIATIONS.)



STEP THREE: DIVIDE SPAN OF RECTANGLE INTO EQUAL UNITS, SUBDIVIDING LAST REMAINING UNIT.



STEP FOUR: DIVIDE HALF CIRCLE ARCS INTO EQUAL UNITS, SUBDIVIDING LAST REMAINING UNIT. FOR SMALL PLANFORMS FOUR TO FIVE UNITS ARE SATISFACTORY, WHILE FOR LARGER PLANFORMS AS MUCH AS EIGHT TO TEN UNITS ARE RECOMMENDED FOR OBTAINING AN ACCURATE ELLIPTICAL PLANFORM.



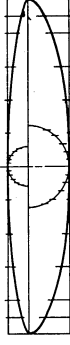
STEP FIVE: DIVIDE THE SPAN OF RECTANGLE INTO THE SAME NUMBER OF UNITS AS THAT OF EACH HALF CIRCLE ARC.



STEP SIX: CONNECT CORRESPONDING UNIT STATIONS BY PROJECTING THEM UNTIL THEY INTERSECT, PRODUCING POINTS ON THE ELLIPTICAL PLANFORM.



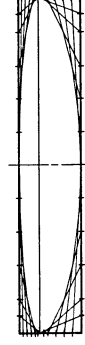
STEP SEVEN: USING FRENCH CURVES CONNECT PLOTTED POINTS TO OBTAIN ELLIPTICAL PLANFORM.



STEP FOUR: DIVIDE EACH SECTION OF THE CHORD INTO HALF THE NUMBER OF UNITS ON THE SPAN OF RECTANGLE.



STEP FIVE: CONNECT CORRESPONDING UNIT STATIONS BY PROJECTING DIAGONAL LINES.



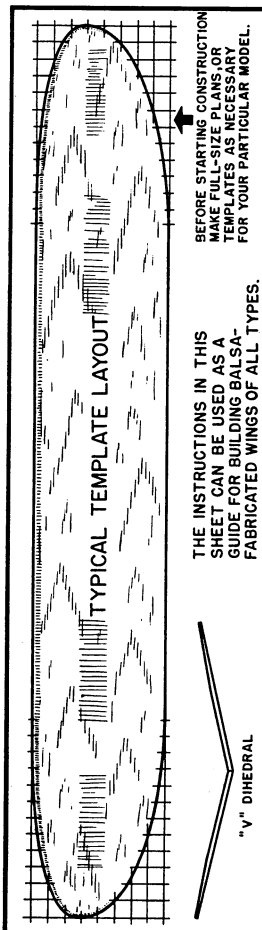
STEP SIX: USING FRENCH CURVES DRAW IN PARABOLIC PLANFORM BY FOLLOWING THE INSIDE PATTERN OBTAINED FROM DRAWING THE DIAGONAL LINES.



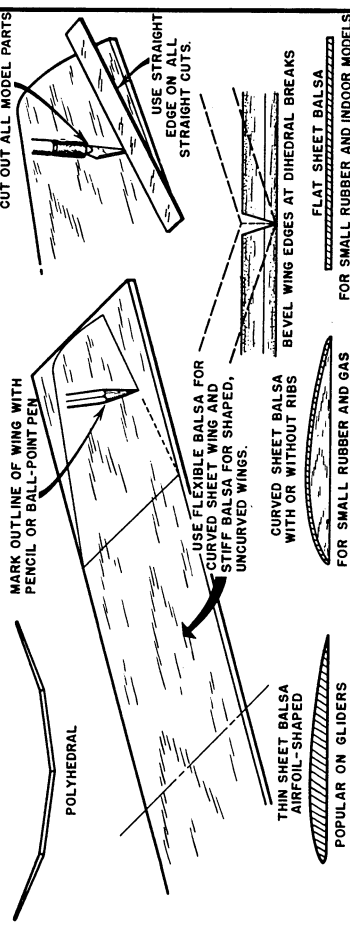
P.D.G.

FM CONSTRUCTION SHEETS

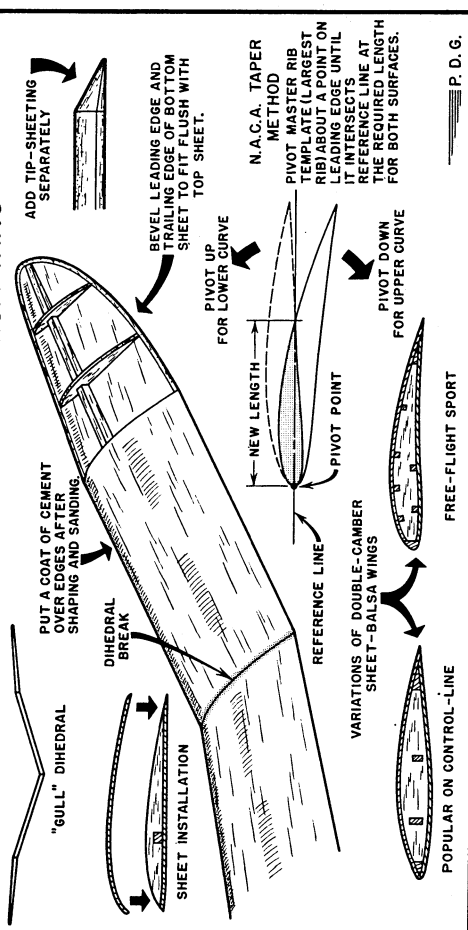
BALSA FABRICATED WINGS



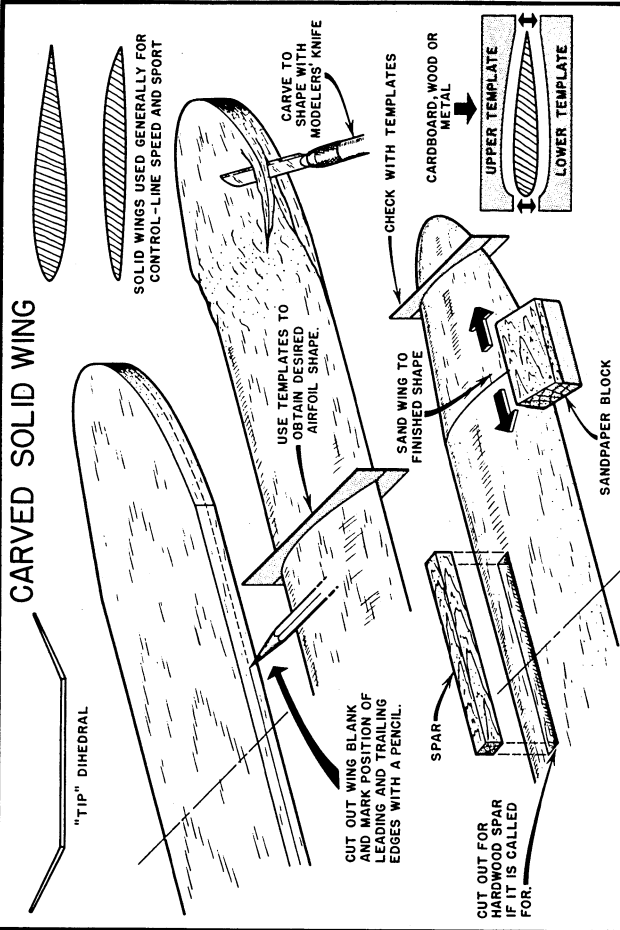
SINGLE-CURVE SHEET-BALSA WING



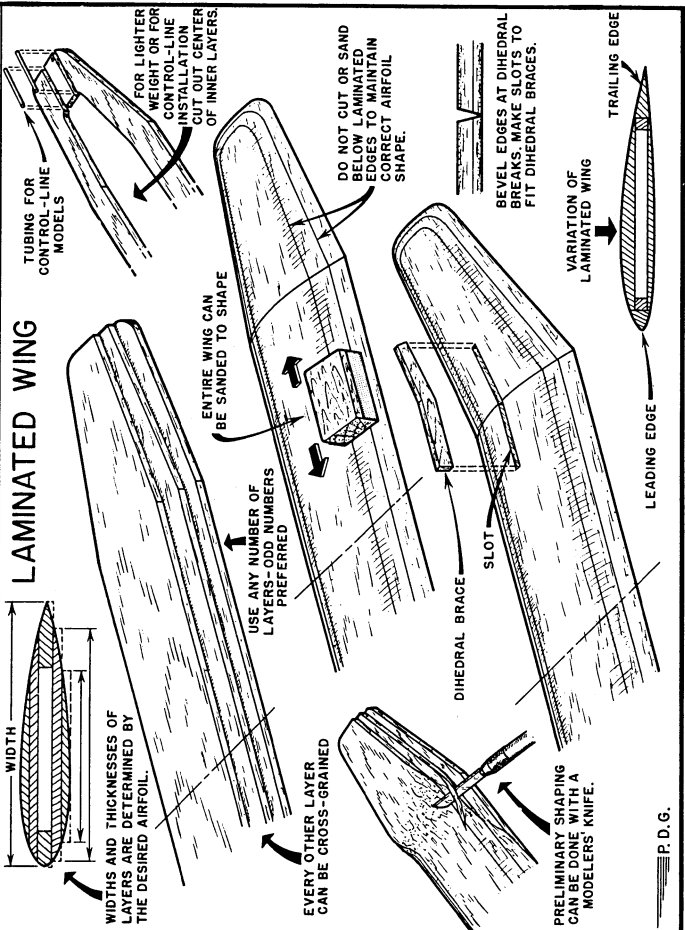
DOUBLE-SURFACE SHEET-BALSA WING



CARVED SOLID WING



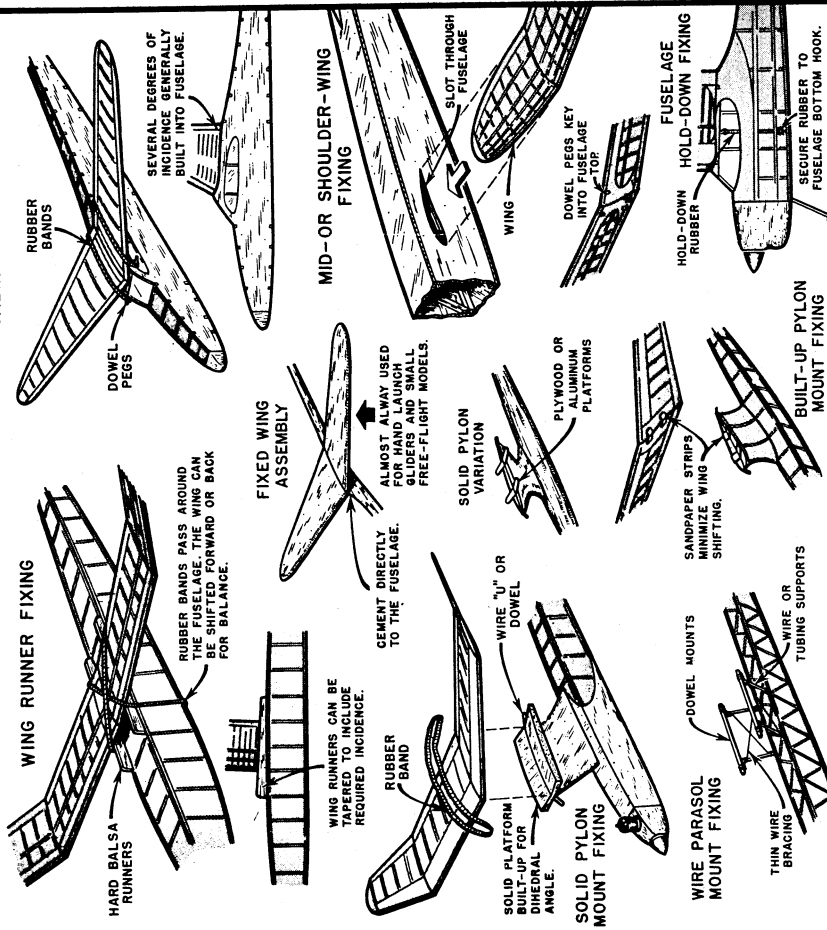
LAMINATED WING



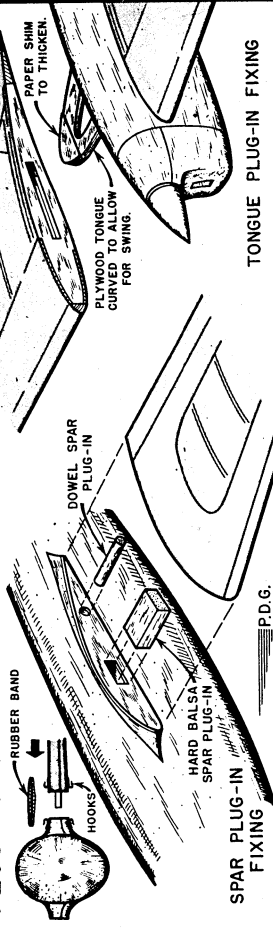
FM DATA SHEETS

WING AND TAIL FIXINGS

BASIC WING HOLD-DOWNS:

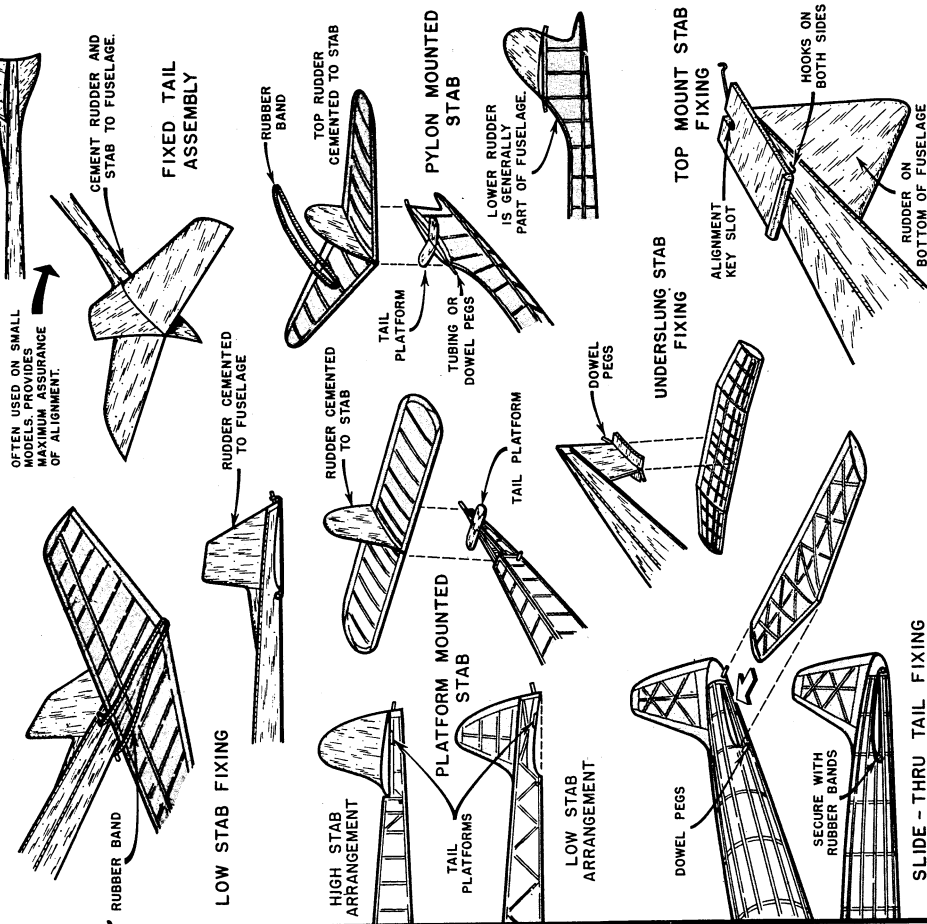


PLUG-IN WING INSTALLATIONS:

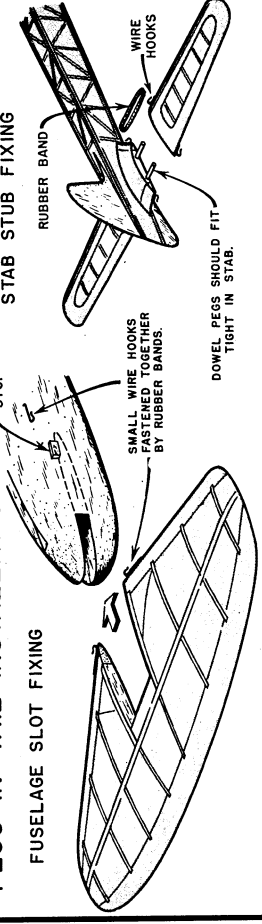


P.D.G.

BASIC TAIL HOLD-DOWNS:



PLUG-IN TAIL INSTALLATIONS:

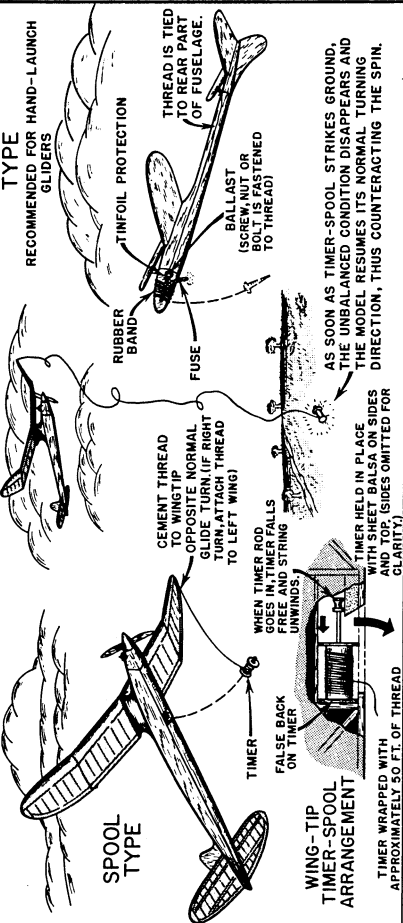


P.D.G.

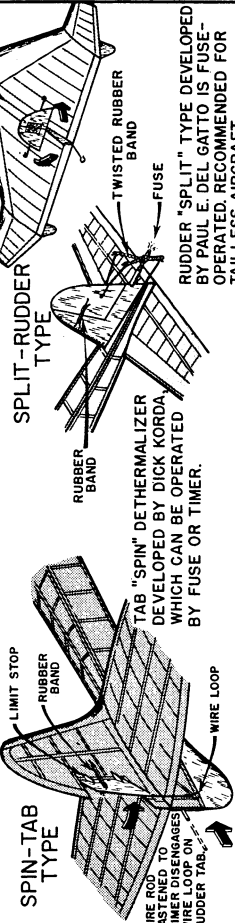
FM DATA SHEETS

DETHERMALIZERS AND HOOK-UPS

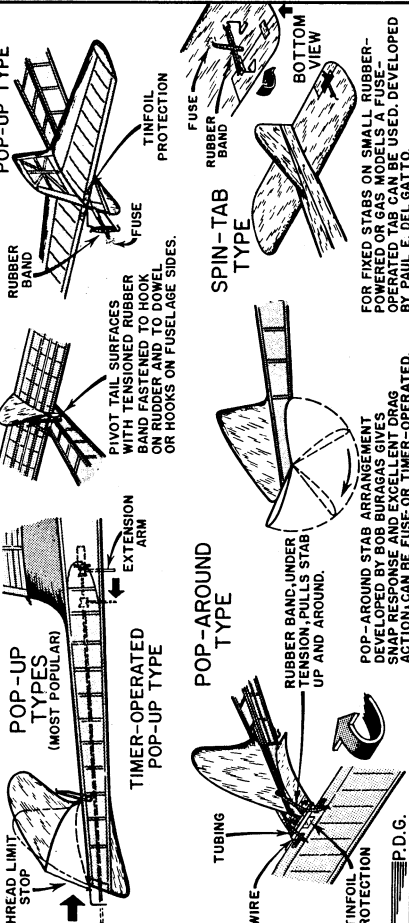
WEIGHT-SHIFTING DETHERMALIZERS:



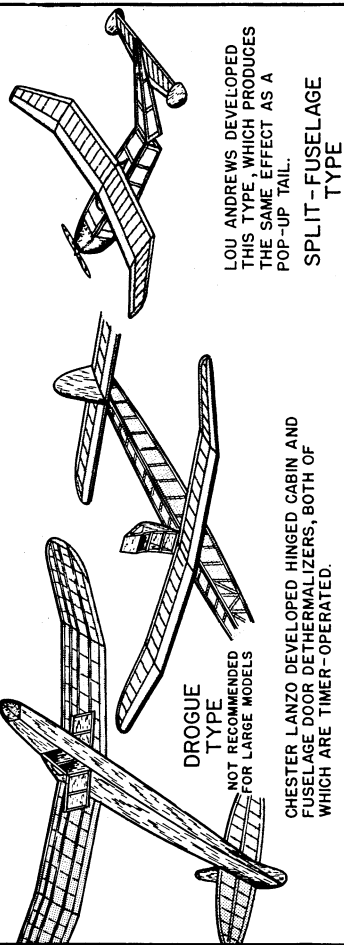
RUDDER-DISTURBANCE DETHERMALIZERS:



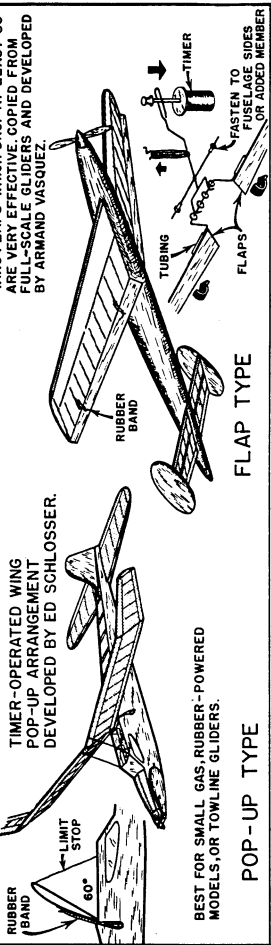
STABILIZER-DISTURBANCE DETHERMALIZERS:



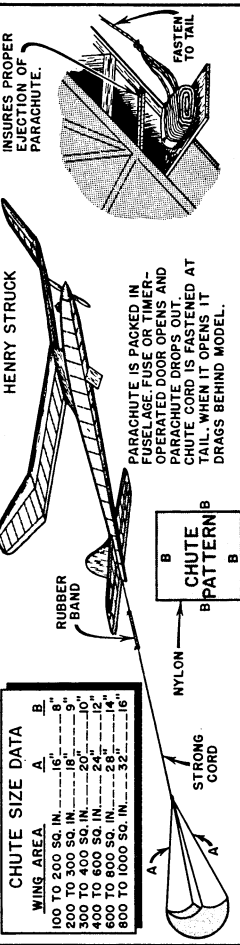
FUSELAGE-DISTURBANCE DETHERMALIZERS:



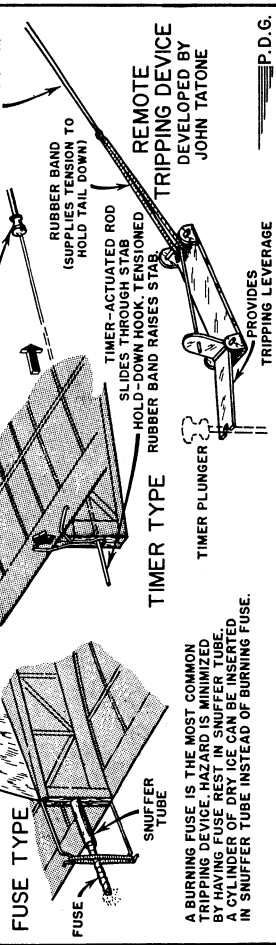
WING-DISTURBANCE DETHERMALIZERS:



PARACHUTE DETHERMALIZER:



TRIPPING DEVICES:



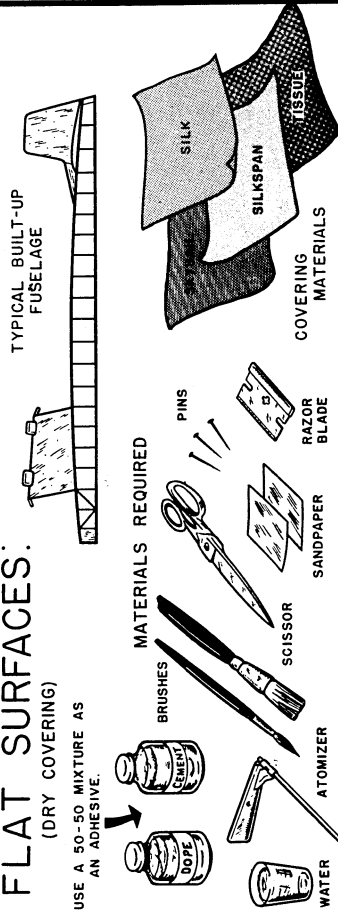
FM CONSTRUCTION SHEETS

COVERING MODEL AIRPLANES

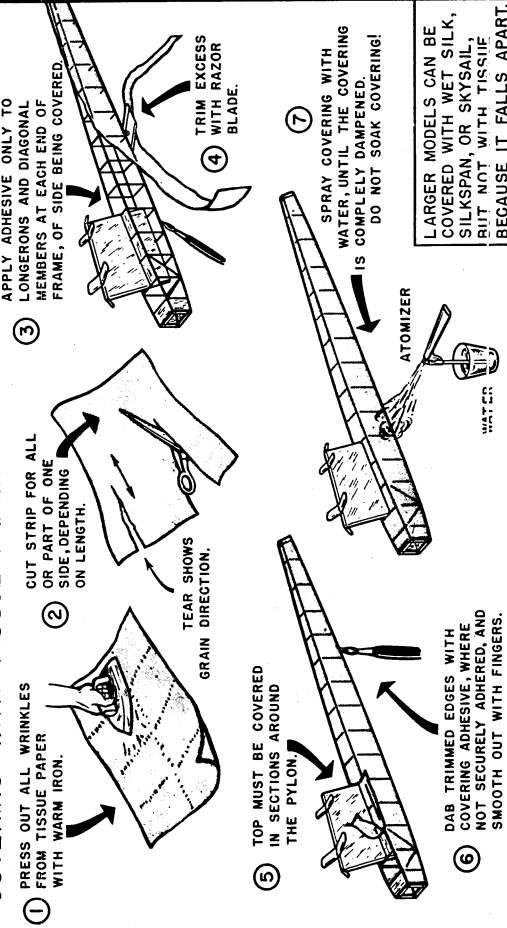
FLAT SURFACES:

(DRY COVERING)

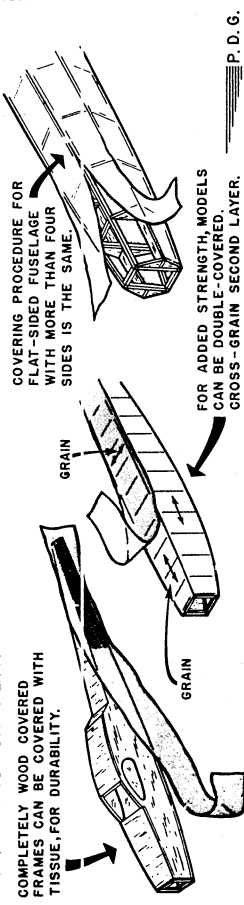
USE A 50-50 MIXTURE AS AN ADHESIVE.



COVERING WITH TISSUE PAPER:



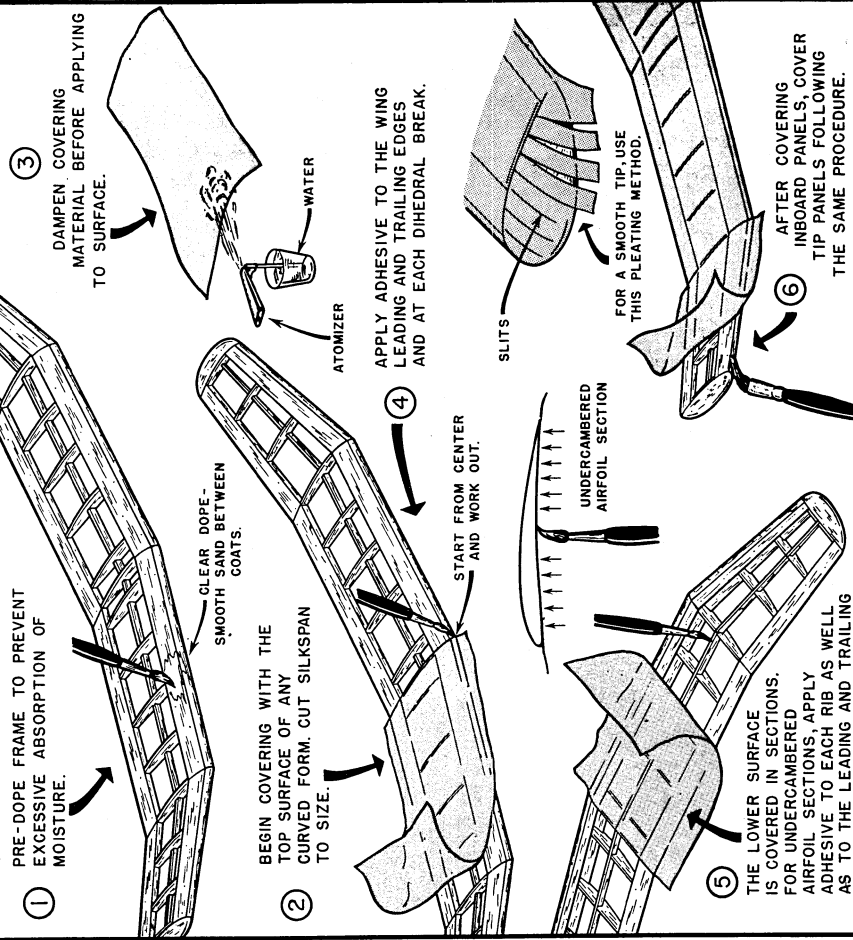
VARIATIONS ON FLAT SURFACE COVERING:



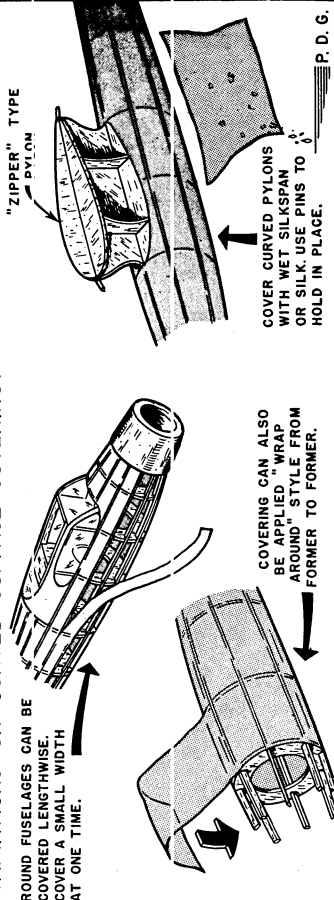
P. D. G.

CURVED SURFACES:

(WET COVERING)



VARIATIONS ON CURVED SURFACE COVERING:



P. D. G.

FM DATA SHEETS

COVERING AND FINISHING

COVERING MATERIALS:

SELECT YOUR COVERING MATERIAL FOR THE JOB WHICH IT MUST DO. FOR THE AVERAGE GAS OR RUBBER MODEL, ANY OF THE STANDARD GRADES OF TISSUE WILL DO NICELY. WHEN ADDED DURABILITY IS DESIRED, USE SILK OR NYLON.

PREPARATION:

WINGS WITH POLYHEDRAL SHOULD BE COVERED PANEL BY PANEL, FIRST THE UPPER CAMBER, THEN THE LOWER.

YOUR GRAIN IN TISSUE MUST RUN SPANWAYS. EXCEPTION IS DOUBLE COVERING TOP LAYER.

GRAIN RUNNING CHORDWAYS CAUSES SAG BETWEEN RIBS.

DETERMINE GRAIN BY TEARING PART OF TISSUE. IMPORTANT!

ALL DENTS, FUZZ, EXCESS STOCK, CEMENT GLOBS ETC. MUST BE TRIMMED OR SANDED OFF.

A WING WITH PLAIN DIHEDRAL MAY BE COVERED MORE EASILY. NEVER WRAP COVERING AROUND WING IN ONE PIECE.

FOR GLOW-PLUG POWERED MODELS, EITHER FUELPROOF OR NON-FUELPROOF DOPE IS REQUIRED. ALSO, FINISHERS, BRUSHES AND COVERING.

FOR COVERING DRY AND FOR CEMENTING EDGES, THICKEN DOPE WITH A LIBERAL DOSE OF CEMENT. APPLY WITH PAINT BRUSH.

COVERING DRY:

STEP I - CUT A LARGE ENOUGH PIECE OF COVERING MATERIAL FOR CONVENIENCE.

STEP II - APPLY THICKENED DOPE TO T.E., AND DOPE AS INDICATED BY "X" MARKS.

STEP III - PULL TAUT AS INDICATED AND IN ORDER OF NUMBERED ARROWS.

STEP IV - SUT COVERING AS NECESSARY TO NEGOTIATE WING TIP. DOPE EDGES.

STEP V - REVERSE SIDE IS COVERED NEXT. WATER WING PRIOR TO CLEAR DOPING.

DO'S AND DON'TS:

WHEN COVERING A FLAT BOTTOM WING, IT IS NOT ADVISABLE TO DOPE BOTTOM TO EACH RIB AND SPAR, AS THIS MIGHT CAUSE UNEVEN SHRINKAGE. IF THE BOTTOM OF YOUR WING IS UNDERCAMBERED, APPLY A COAT OF THINNED-DOWN CEMENT TO EACH RIB AND SPAR TO PREVENT THE COVERING FROM BRIDGING THE CONCAVE SURFACE.

DO NOT USE SILK ON WEAK OR LIGHTWEIGHT STRUCTURES. HEAVILY DOPED SILK HAS BEEN KNOWN TO CRUSH AND WARP FRAMEWORK.

RELY ON COLORED TISSUE OR DYES FOR COLOR OR PRE-FLIGHT MODELS, RATHER THAN EXCESSIVE QUANTITIES OF HEAVY PIGMENTED DOPES.

WHEN USING FUEL PROOF DOPE AND ALLIED PRODUCTS, DO NOT MIX BRANDS. SANDING SEALERS DESIGNED FOR USE WITH THE SAME COMPOUND. CLEAR DOPE, MAY CAUSE TROUBLE WHEN APPLIED UNDER A COMPETITIVE BRAND.

IF YOUR MODEL IS INTENDED FOR USE AS A SEA-PLANE, IT IS ADVISABLE TO SPRAY THE ENTIRE FRAMEWORK WITH TWO COATS OF CLEAR DOPE. THIS RETARD ABSORPTION OF MOISTURE. CLEAR DOPE IS MORE DURABLE AND THEREFORE EASIER TO WATERPROOF.

COVERING WET:

SATURATE TISSUE IN WATER PAN OF COOL WATER. PLOT OR SHAKE OFF EXCESS MOISTURE, BEFORE COVERING.

PULL TAUT AND FREE OF WRINKLES AS SHOWN BY ARROWS. KEEP DAMPENING.

STEP II - APPLY THIN DOPE ON TOP OF WET COVERING AS INDICATED BY "X" MARKS.

STEP III - TRIM WITH RAZOR AND DOPE DOWN EDGES. (THICK DOPE).

STEP IV - COVER REVERSE SIDE IMMEDIATELY. DOPED ON.

COMPOUND CURVATURES:

AS DRY TISSUE IS NOT SUITABLE FOR COMPOUND CURVES, WING TIPS SUCH AS THIS SHOULD BE COVERED WET.

THE TAPERING AIRFOIL CREATES A CURVE IN THE THIRD DIMENSION. A PARACHUTE IS A PERFECT EXAMPLE OF THE INDIVIDUAL "GORE" METHOD OF COVERING.

A ROUNDED STRINGERED FUSELAGE MAY BE COVERED DRY, BY COVERING EACH SECTION WITH SEVEN STRINGERS INDIVIDUALLY.

NOTE CROSS-SECTION WITH SEGMENTS "A, B, C" WHICH MAY BE COVERED WITH WET TISSUE.

SEG. B - MAY BE COVERED WITH ONE PIECE OF SILK. SEG. C - DRY TISSUE.

COMPOUND CURVATURES ARE COVERED BY THE METHODS DESCRIBED ABOVE.

PAIRED SILK PYLONS ARE DIFFICULT. USE WET SILK ONLY. PULL VERY TIGHT IN ALL DIRECTIONS. HOLD WITH PINS, CEMENT. FORMERS DO NOT TOUCH SILK!

COVERING HINTS:

UNDERCAMBER COVERING SHOULD BE CEMENTED TO EACH RIB.

DOPING CAUSES SAGGING OF POORLY BRACED LONGERONS.

USE THIN COATS OF DOPE, WELL BRUSHED.

TIGHT WATERLINE AVOIDS THIS.

SEC. A - POOR FAIRED SILK PYLON DESIGN.

SEC. B - GOOD WING MOUNT, UNDERCUT FORMER.

PULL COVERING VERY TIGHT ON SHORTEST DIMENSIONS. AVOIDS WRINKLE.

DOPING:

USE A GOOD KNOWN GRADE OF DOPE. BE CAREFUL. WE CAN GIVE YOU THINNESS TO DOPE WHAT TURPENTINE IS TO PAINT. KEEP YOUR DOPE THIN AND APPLY IN SMOOTH, EVEN STROKES. DRY WELL BETWEEN COATS.

USE A GOOD BRUSH, BRISTLES SET IN RUBBER.

NO YES

WARP REMOVAL:

TRAILING EDGE TROUBLES - YOUR TRAILING EDGE (FRONT VIEW) WARPED TRAILING EDGE (COVERED) EXCELLENT FOR A SMALL MODEL, BUT A TEA KETTLE VS. A TEA KETTLE IS SELDOM ENOUGH.

DOPE-OUT - DOPE PANEL, HOLD TILL DRY. DOPE PANEL AGAIN, HOLD TILL DRY. REPEAT WITH WATER. TWIST IN VERY HOT FAUCET TO SUICIDE. NEVER WORKS WELL ANYWAY. FORGET IT!

STEAM-OUT - DOPE PANEL, HOLD TILL DRY. DOPE PANEL AGAIN, HOLD TILL DRY. REPEAT WITH WATER. TWIST IN VERY HOT FAUCET TO SUICIDE. NEVER WORKS WELL ANYWAY. FORGET IT!

FINISHING:

LIGHTLY SAND OFF SPOTS, BUBBLES, ETC. WITH 10-0 SANDPAPER.

TRIM COVERING EDGES SUCH AS THIS WITH SANDPAPER.

OCCASIONALLY RUBBER DEVELOP A SLIGHT TWIST BEFORE COVERING. SEE CROSS-SEC.

THIS CONDITION CAN EASILY BE RECTIFIED BEFORE COVERING AS SHOWN BELOW.

SUP RUBBER MOTOR INTO FUSELAGE AND WIND MOTOR UNTIL FUSELAGE BACK TO NORMAL LOCK PROOF & COVER.

PATCHING:

REMOVE RIPPED COVERING WITH A RAZOR. IF POSSIBLE REMOVE A BIT OF SURROUNDING TISSUE SO PATCH MAY BE CEMENTED TO WOOD, ELIMINATING DOUBLE-DOPE. PATCH TO MATCH WATER AND DOPE.

DECALS:

MOST DECALS REQUIRE SPECIAL ATTENTION IF THEY ARE TO BE EXPOSED TO FUEL PROOF AND HOT GLOW FUEL. GLOW FUEL RUINS UNDOPED DECALS. SUBSTITUTION EFFECT.

AMA

NUMBERS & TRIM MAY BE CUT FROM COLORED TISSUE, THEN DOPED ON.

FM DATA SHEETS

ELIMINATION OF STRUCTURAL WEAK SPOTS

COMMON TROUBLE SPOTS IN CABIN TYPE FUSELAGES:

EVER NOTICE HOW SOME BUILDERS SPEND THEIR TIME AT THE FIELD, MAKING REPAIRS? ANYBODY CAN HAVE A LITTLE BAD LUCK, BUT THOSE PLACED WITH IT ARE USUALLY THE ONES WHO PAY THE LEAST ATTENTION TO CONSTRUCTION DETAILS. BY ANTICIPATING TROUBLESPOTS WHICH THE MODEL IS LIKELY TO ENCOUNTER, IT IS POSSIBLE TO STRENGTHEN THE MODEL ACCORDINGLY, AND DOUBLE ITS LIFE EXPECTANCY.

WARP RESISTANCE COULD BE IMPROVED BY INLAYING STRIPS OF CROSS-GRAIN.

A CORRAL, SO MOUNTED, IS APT TO CRACK OPEN TOP FUSELAGE TISSUE.

THE CABIN AREA IS THE BIGGEST PROBLEM ON THIS TYPE MODEL. BEAR IN MIND THE WING, STRIKING AN OBJECT IN FLIGHT, WILL INFLUENCE THE WING MOUNT AREA. WEAKENED BY FUEL SEEPAGE, CELLULOSE MAY BREAK LOOSE IN PLACES. BRACING, GOOD JOINTS AND DOUBLE-CEMENTING IS THE ANSWER.

A HOLD-DOWN HOOK MUST BE SECURED TO STRONGEST STRUCTURAL MEMBERS.

A STAB REST IS VERY IMPORTANT. STAB MUST BE KEPT IN ADDITION.

IF END GRAIN IS NOT GIVEN A PRELIMINARY COAT OF CEMENT, ABSORPTION WILL WEAKEN THE JOINT. THIS IS VERY IMPORTANT.

ONLY THE BEST OF Balsa SHOULD BE USED FOR LONGERONS.

WHENEVER POSSIBLE, UPRIGHTS SHOULD BE IN ONE PIECE, AS IN THIS PARTICULAR DESIGN.

GEAR INSTALLATION:

PLANO WIRE IS STRONGEST WHEN IT IS NOT BENT AT ALL. NECESSARY BENDS SHOULD BE HELD TO A MINIMUM, AND MADE WITH A GREAT DEAL OF CARE TO AVOID CRACKING. ZINC PLATING DOES TOO MUCH ADJUSTING.

THIS GEAR IS SUPERIOR TO ANY OTHER. IT IS NECESSARY AT JUNCTION WITH FUSELAGE.

USE A HEAVY WIRE FOR THE MODEL IN QUESTION.

ONE OF THE BEST METHODS OF MOUNTING GEAR IS WITH TEMPLATE BRACKETS.

NOTE SLANTING PLY MOUNT FOR 3-BEND LANDING GEAR.

INTERNAL DAMAGE:

PAA-LOAD DUMMY, BATTERIES, RECEIVERS AND ALL HEAVY OBJECTS MUST BE BRACED TO WITHSTAND CRASHES WITHOUT TEARING LOOSE.

BATTERIES BEFORE CRASH. NEW LOCATION AFTER CRASH.

JUST A BAD STALL IN THE GLIDE IS ENOUGH TO SEND OBJECT CLEAR THROUGH 4 OR 5 SHEET FORMERS, AS SOON AS THE NOSE IS STRUCK. BRACE & GUSSET!

WEIGHTED PAA-LOAD DUMMY MAY BE DOWNED IN PLACE.

CROSS-SECTIONS:

THERE ARE MANY METHODS OF CONSTRUCTING A FUSELAGE, AND EACH IS BEST IN A DIFFERENT MANNER. THE STRUCTURES BELOW WILL GIVE LITTLE TROUBLE.

USE SELECTED FUSELAGE LONGERONS, GOOD JOINTS THROUGHOUT. PLANKED FUSELAGES ARE REFINEDLY DURABLE.

MOTOR MOUNTS:

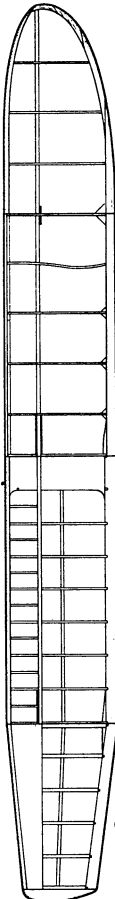
BEAM MOUNTS SHOULD BE LONG ENOUGH FOR GOOD SUPPORT, WELL CEMENTED IN PLACE.

DO NOT USE PINE. MOUNT HOLES DRILLED TOO CLOSE TO END CASE SPLIT AS INDICATED.

RADIAL MOUNTINGS ARE IN WIDEST USE TODAY. THRUST MAY BE ADJUSTED EASILY, BUT MUST BE CEMENTED SECURELY.

WING STRUCTURAL PROBLEMS:

THE GENERAL TENDENCY TODAY IS TO CONSTRUCT A WING FROM AS FEW PIECES AS POSSIBLE. EXPERIENCED WAKEFIELD BUILDERS AND SUCH CUT CORNERS TO SAVE WEIGHT, BUT THEY STILL RETAIN THEIR DESIRED AIRFOIL, RIGIDITY AND NECESSARY STRENGTH. THE OTHER 98% PREFER A SCANTY STRUCTURE AS IT IS THE PATH OF LEAST RESISTANCE, AND THAT IS WHEN THE TROUBLE STARTS.



IF UPON GLANCING AT PANELS 1 AND 2, YOU FEEL THE STRUCTURE IS TOO MUCH BOTHER, THEN YOU ARE ONE OF THE 98%. PANELS 3 AND 4 ARE THE ONES THAT ARE THE REAL BOTHER, FOR THE WARP RESISTANCE, STRENGTH AND AERODYNAMIC QUALITIES WILL BE POOR. EVEN THO THE INITIAL BUILDING TIME OF PANELS 1 OR 2 MAY BE A FEW MINUTES MORE THEY WILL STAND UP AGAINST THE RIGORS OF ACTIVE FLYING. CONSTRUCTION DEFECTS AND ADVANTAGES OF EACH PANEL ARE ITEMIZED BELOW.

PANEL 1 SHEET LEADING EDGE MAINTAINS SMOOTH AIRFOIL. CAP STRIPS ON RISERS PREVENT BOWING AS VISIBLE IN PANEL 3. NOTE GUSSET AT TRAILING EDGE. EXCELLENT.

PANEL 2 VERY GOOD SUBSTITUTE FOR CONSTRUCTION IN PANEL 1. EASIER TO REPAIR. TOP SPAR PREVENTS SAG BETWEEN RISERS. BOTTOM SPAR NOTCHED T.E. EXCELLENT.

PANEL 3 POORLY SUPPORTED THIN RISERS MAY DEVELOP A BOW. DIAMOND-SHAPED L.E. MAY SPLIT RISERS. TISSUE WILL SAG BETWEEN RISERS. BOTTOM SPAR POOR. T.E. GUSSETS ARE GOOD.

PANEL 4 REALLY CRUDE! TIP FAR TOO WEAK. IT'S ALMOST BOUND TO BREAK OR WARP. LAMINATED LEADING EDGE WOULD RELIEVE PRESSURE. SPAR GUSSET WILL PROBABLY FAIL.

AIRFOIL PROBLEMS:

THERE IS NO PERCENTAGE IN PLOTTING AN AIRFOIL AND THEN MISSING THE JOB UP WITH A SECTION THAT WILL NOT HOLD ITS SHAPE.

THE RIB ILLUSTRATED ABOVE HAS THREE WEAK SPOTS. A HARD BLOW MAY SPLIT RIB AT L.E. RIB MAY CRACK ABOVE SPAR DURING CONSTRUCTION. TRAILING EDGE WILL TRY TO PULL DOWN.

UNDERCAMBER IS FREQUENTLY USED TO ADVANTAGE, BUT BEWARE OF WARPS LIKE THIS. BLAME POOR SPAR-RIB FIT.

THE SERIOUS BUILDER PREFERS SECTIONS LIKE THIS, CAPABLE OF HOLDING A TRUE AIRFOIL. NOTE SHEET SPAR WEB BETWEEN RISERS.

TRAILING EDGE:

DUE TO THE RELATIVELY SMALL CEMENTING SURFACE OF THE RIB-TRAILING EDGE BUTT-JOINT, IT SHOULD BE STRENGTHENED AS ILLUSTRATED BELOW.

1 - GOOD IDEA, BUT TOO DEEP A NOTCH WEAKENS T.E. 2 - IS EXCELLENT.

3 - TRIANGULAR GUSSET IS FINE, BUT ALLOWS A DIFFERENT APPROACH. VERY GOOD.

4 - SHEET TRAILING EDGE SETS ARE FINE, BUT APPROACH. VERY GOOD.

CHOICE OF Balsa:

YOUR MODEL, LIKE A CHAIN WITH A WEAK LINK, IS ONLY AS STRONG AS THE WEAKEST LINK. Balsa IN IT. NONE BUT THE BEST Balsa SHOULD BE USED FOR MAIN STRUCTURAL MEMBERS.

BEWARE OF SWIRLING OR UN-EVEN GRAIN. IT WILL FAIL UNDER STRESS.

SELECT THE STRAIGHTEST, WARP-FREE Balsa FOR SPARS, LONGERONS, LEADING AND TRAILING EDGES ETC. STEER CLEAR OF MUSHY STOCK.

SOFTER MORE FLEXIBLE CUTS OF Balsa NEGOTIATE FOR MORE EASILY. BUT LEADING EDGE FLANKING, FUSELAGE PLANKING, ETC. RIBS AND SIMILAR PLACES.

WARPS-ALIGNMENT:

AN EXPERT MAY MISALIGN AND WARP HIS FLYING SURFACES PURPOSELY, BUT IF YOU DON'T UNDERSTAND THE CAUSE AND EFFECTS OF SUCH, YOU'LL DO BETTER TO AVOID SLOPPY RESULTS LIKE THE EXAMPLE ABOVE.

WING AND STAB MUST BE SHIMMED INTO ALIGNMENT IN SUCH CASES. STAB REST MUST BE FIRM. LOCK STAB WITH DOWEL PINS TO PREVENT SIDE MOVEMENT. REMOVE WARPS WITH HOT WATER OR STEAM.

VIBRATION:

VIBRATION IS THE UN-DESIRED MODEL KILLER.

TO SQUELCH IT AS THE SOURCE, SAND PROPS BLADES UNTIL PROPER BALANCE IS ACHIEVED. TRY TO AVOID ENGINE SPEEDS WHERE MODEL COVERING IS HEARD RESONATING WITH ENGINE.

ENGINE MUST BE TIGHT ON MOUNTS. FOAM RUBBER MAY BE USED IN MANY CASES TO ABSORB VIBRATION.

REPAIRS:

USE GOOD CEMENT!

ORIGINAL STRENGTH MUST BE RETURNED. CONDITION ABOVE CAN BE RECREATED WITH PLY GUSSET ON SPICE.

WHEN POSSIBLE, MAJOR REPAIRS ARE BEST MADE OUTDOOR WITH SLOW DRYING MODEL CEMENT. DO THE JOB RIGHT TO AVOID A RE-EDITION ON THE FIELD.

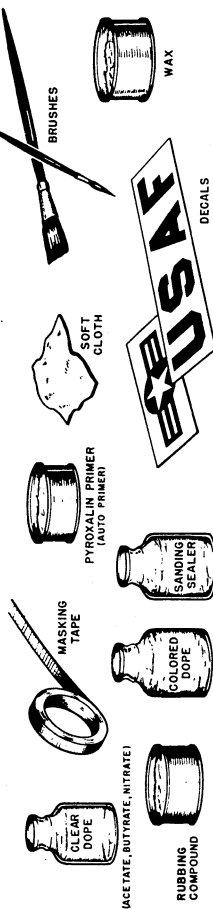
QJM

FM CONSTRUCTION SHEETS

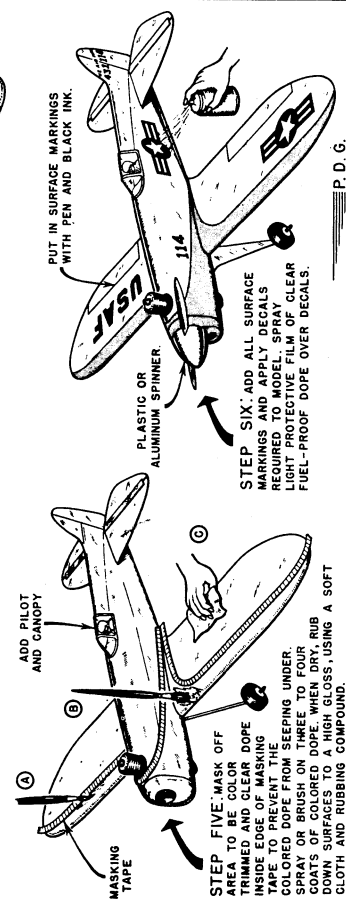
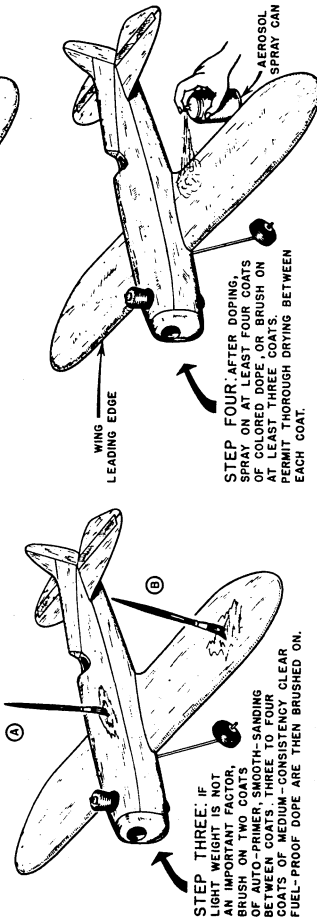
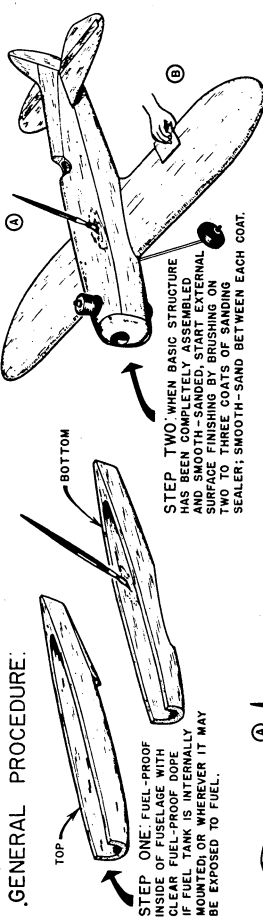
FINISHING MODEL AIRPLANES

WOOD FINISHING:

MATERIALS REQUIRED



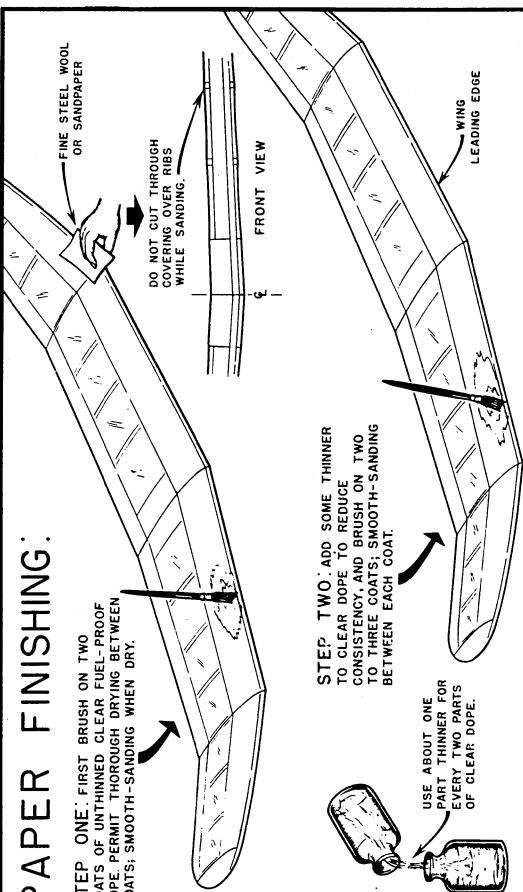
GENERAL PROCEDURE:



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PAPER FINISHING:

STEP ONE: FIRST BRUSH ON TWO COATS OF UNTHINNED CLEAR FUEL-PROOF DOPE. PERMIT THOROUGH DRYING BETWEEN COATS; SMOOTH-SANDING WHEN DRY.

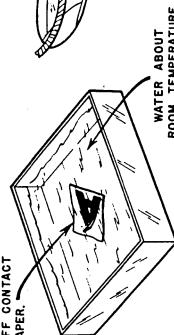


STEP FOUR: CLEAR DOPE THE INSIDE EDGE OF MASKING TAPE TO PREVENT THE COLORED DOPE FROM SEEPING UNDER WHEN APPLIED TO WING SURFACES.

STEP FIVE: APPLY TWO TO THREE COATS OF MEDIUM CONSISTENCY COLORED DOPE TO MASKED LEADING EDGE SURFACES.

NOTE: TO PREVENT OR ELIMINATE BLUSHING OF CLEAR AND COLORED DOPE IN HUMID WEATHER ADD A COAT OF RETARDER. ABOUT FOUR DROPS OF RETARDER SHOULD BE ENOUGH FOR EACH OUNCE OF DOPE.

PERMIT DECAL TO SOAK ONLY UNTIL IT CAN BE SLID INTO CONTACT WITH PAPER.



STEP SIX: APPLY DECALS TO SURFACES FOR ADDED APPEAL.

STEP EIGHT: FOR ADDED LUSTRE RUB DOWN SURFACES WITH WAX, USING A SOFT CLOTH DAMPENED WITH LIQUID OR SOLID WAX.

STEP SEVEN: SPRAY LIGHT FILM OF CLEAR DOPE OVER DECALS TO SECURE PERMANENTLY IN PLACE.

P. D. G.

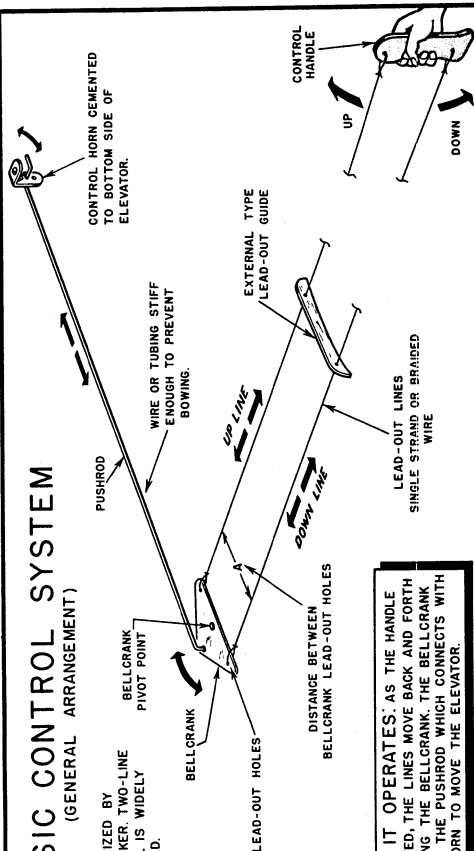
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FM DATA SHEETS

TWO-LINE CONTROL SYSTEMS

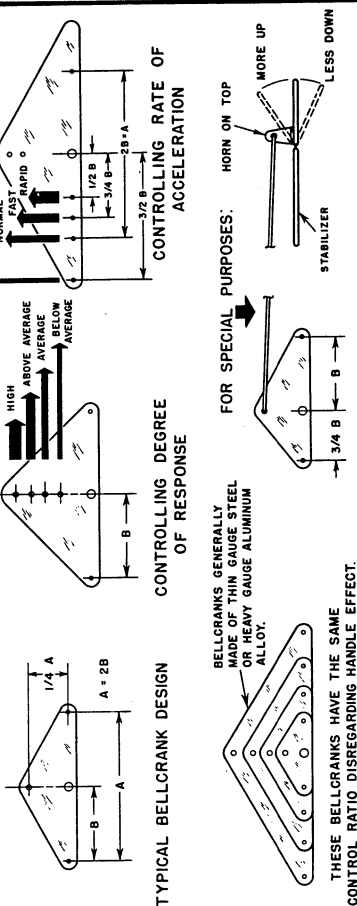
BASIC CONTROL SYSTEM (GENERAL ARRANGEMENT)

POPULARIZED BY
JIM WALKER, TWO-LINE
CONTROL IS WIDELY
ACCEPTED.

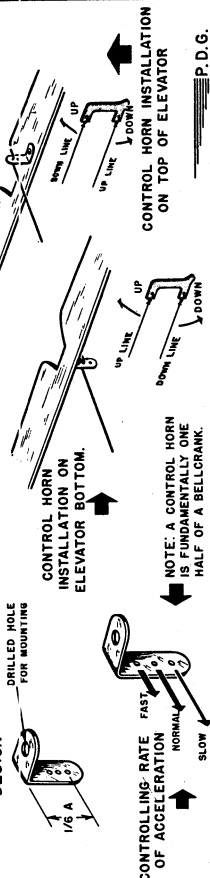


HOW IT OPERATES: AS THE HANDLE IS MOVED, THE LINES MOVE BACK AND FORTH PIVOTING THE BELLCRANK. THE BELLCRANK MOVES THE PUSHROD WHICH CONNECTS WITH THE HORN TO MOVE THE ELEVATOR.

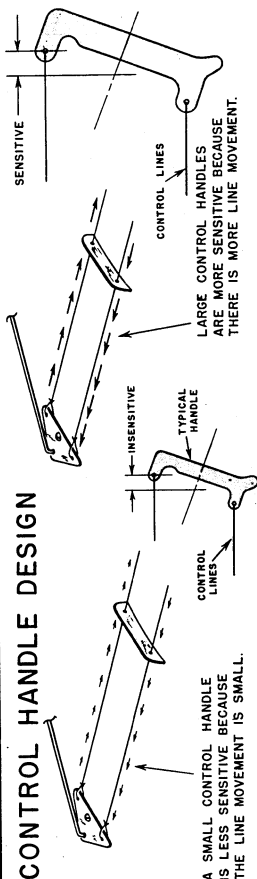
BELLCRANK AND CONTROL HORN DESIGN



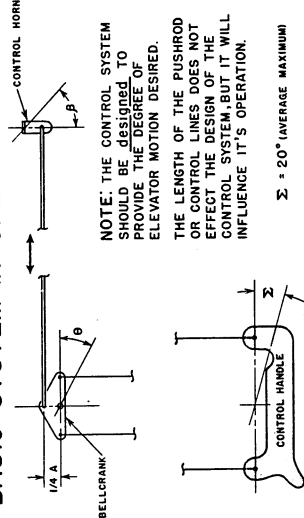
TYPICAL CONTROL HORN DESIGN



CONTROL HANDLE DESIGN



BASIC SYSTEM IN OPERATION

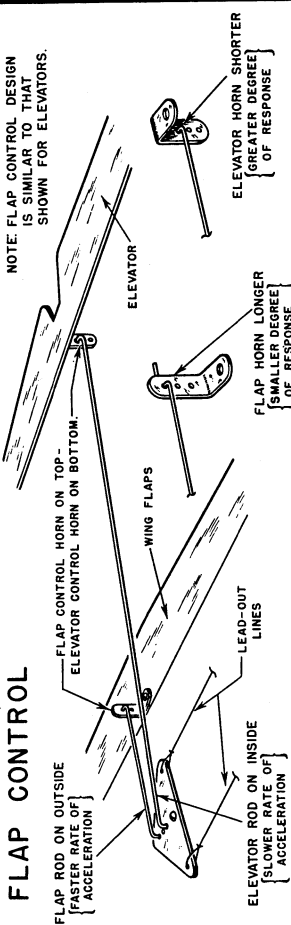


EXAMPLES OF DESIGN

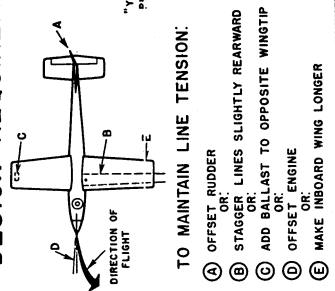
BELL-CRANK	CONTROL HANDLE	CONTROL HORN	Σ	θ	β
3"	5 1/2"	3/4"	20°	37°	33°
3"	5"	5/8"	20°	34°	36°
3"	4-1/2"	1/2"	20°	30°	41°
2"	5"	1/2"	20°	50°	45°
2"	4-1/2"	1/2"	20°	46°	40°
2"	4"	3/8"	20°	40°	46°
1-1/2"	5"	1/2"	20°	70°	50°
1-1/2"	4-1/2"	3/8"	20°	64°	54°
1-1/2"	4"	5/16"	20°	57°	61°

$\Sigma = 20^\circ$ (AVERAGE MAXIMUM)

FLAP CONTROL



DESIGN REQUIREMENTS



FOR "V" TAILS USE, "Y" SHAPED OR "T" SHAPED PUSHROD AND TWO CONTROL HORNS.

FLYING WINGS ARE DESIGNED AND HOOKED UP IN THE SAME MANNER AS FLAP AND ELEVATOR CONTROL SYSTEMS.

FM DATA SHEETS

CONTROL-LINE INSTALLATION

INSTALLATION DETAILS FOR JIM WALKER "U-CONTROL" SYSTEM

COMPONENT PARTS:

- BELLCRANK: METAL IS ADVISED, AVAILABLE COMMERCIAL
- ELEVATOR HINGE
- ELEVATOR
- STABILIZER
- HORN
- PUSHPROD GUIDE
- PUSHPROD
- PIVOT BOLT
- LINE GUIDE
- LEADOUTS
- BELLCRANK
- OTHER POPULAR CONTROL SYSTEMS INCLUDE THE "MONO-LINE", DESCRIBED IN FEB. 1952 FLYING MODELS, AND THOSE OF VARIOUS KIT MANUFACTURERS, DESCRIBED IN THEIR KIT PLANS.

BASIC LAYOUT:

UP AND DOWN WREST MOTION ON THE CONTROL LINE MUST BE TRANSMITTED TO THE PUSHPROD AND ELEVATOR HORN, THEREBY PRODUCING UP AND DOWN ELEVATOR ACTION.

SNAP OR SLIDE CONNECTORS: CONTROL HANDLE SHOULD BE STRONG, EASILY ADJUSTED

CONTROL LINE WIRE: USE SIZES ADVISOR, AVAILABLE COMMERCIAL

ELEVATOR HORN: CONNECTS PUSHPROD TO ELEVATOR

PUSHPROD: ACTIVATES ELEVATOR

CONNECTORS: FIRST INTRODUCED ON "U-CONTROL" SYSTEM HAS GAINED WIDESPREAD POPULARITY

PROBLEMS: SIMPLE AS THIS CONTROL SYSTEM IS, PROBLEMS CAN BE ENCOUNTERED IF NOT CAREFUL. TROUBLE SPOTS ARE NUMBERED ON LAYOUT SKETCH.

1 CONTROL HANDLE SHOULD BE ADJUSTABLE SO THAT IT MAY BE SET FOR NEUTRAL ELEVATOR ON ANY MODEL

2 FLEXIBLE STEEL CABLE HANDLE LEADOUTS ARE ADVISED. BRONZE CABLE, CATGUT, FISHLINE, ETC. WILL BREAK UNDER STRESS.

3 WEAK CONNECTORS ARE DANGEROUS. PULL TEST TO AVOID ACCIDENTS.

4 DO NOT USE THINNER WIRE THAN RECOMMENDED FOR YOUR ENGINE.

5 LINES MUST BE FREE OF KINKS.

6 LINES SHOULD BE CORRECT LENGTH.

7 ALL WIRE CONNECTIONS SHOULD BE SLIP-PROOF, SOLDERLESS, WRAPPED.

8 LINE GUIDE ON WING MUST NOT HIT CONNECTORS, OR CHAFE ON LINES. NO LINE GUIDE IS NEEDED IF LINES RUN THROUGH WING.

9 WIRE CONNECTION AT BELLCRANK MUST NOT SNAP ON FUSELAGE SIDE, OR LIMIT BELLCRANK MOVEMENT.

10 IN LARGE OR HIGH POWERED MODELS, ANCHOR PIVOT BOLT MUST BE MOTOR MOUNTS FOR SAFETY.

11 SOLDER NUT TO PREVENT LOOSENING

12 IF LESS MOVEMENT OF THE ELEVATOR IS DESIRED, DRILLING HINGE HOLES (NEARER PIVOT) IN BELLCRANK

13 USE LARGEST BELLCRANK POSSIBLE

14 FRICTION COUPLED WITH AIR PRESSURE TEND TO "BOW" THE PUSHPROD. IT CAN WEAKEN YOUR MODEL. SUPPORT IT IN CENTER WITH A GUIDE

15 ELEVATOR HORN (AS SHOULD ALL CONNECTIONS) MUST FORM A SNUG FIT WITH PUSHPROD TO PREVENT PLAY.

16 CROSS-BAR (CONNECTING ELEVATORS) MUST BE STRONG, WARP RESISTANT. USE HARDWOOD OR PIANO WIRE.

17 HINGES MUST BE RUGGED, FUEL-PROOF, WARP-PROOF, UNAFFECTED BY VIBRATION AND FRICTION-FREE.

BELLCRANK TYPES:

NOTE WHAT OCCURS WHEN TOO SMALL A BELLCRANK IS USED. LEADOUT WIRES TRAVEL TOO FAR, NECESSITATE SLOTS IN FUSELAGE. LEVERAGE ALSO IS LOST FOR ELECTRICAL TWO-WIRE BELLCRANK.

THESE TYPES REQUIRE NO SOLDERING.

1 BOLT TO ELEVATOR

2 WASHER

3 WIRE

4 SOLDER

5 WIRE CROSS-BAR

6 FIREBALL TYPE

7 SOLDER, THEN CEMENT AND BIND TO CROSS-BAR.

ELEVATOR HORNS:

1 BOLT TO ELEVATOR

2 WASHER

3 WIRE

4 SOLDER

5 WIRE CROSS-BAR

6 FIREBALL TYPE

7 SOLDER, THEN CEMENT AND BIND TO CROSS-BAR.

CONTROL HANDLES:

SIMPLEST OF ALL STEEL CABLE INSTALLATIONS IS SHOWN HERE. READILY ADJUSTABLE, IT MAY BE ADJUSTED TO CORRESPOND TO NEUTRAL ON ANY MODEL. MANY EXCELLENT HANDLES ARE AVAILABLE COMMERCIAL

COLOR ON HALF OF HANDLE.

PUSHPRODS:

JOGGLE CONNECTIONS ARE EXCELLENT ON CONVENTIONAL WIRE TYPES. TUBING (WITH FLATTENED, DRILLED ENDS) SOMETIMES USED.

REDUCING BELLCRANK SWING REDUCES ELEVATOR TRAVEL, BUT NOT THE SENSITIVITY. MOVING PUSHPROD INTO A HOLE CLOSER TO THE PIVOT POINT WILL REDUCE SENSITIVITY.

ALTERNATIVE METHODS:

INCREASE SENSITIVITY

DECREASE SENSITIVITY

INCREASE PUSHROD HOLES

DECREASE PUSHROD HOLES

TEST FLY WITH STIFF ELBOW.

SENSITIVITY:

THE MOST COMMON CAUSE OF CRASHES AMONG NEW FLYERS IS OVER-CONTROLLING. BY REDUCING THE SENSITIVITY OF THE PUSHPROD, THE POSSIBILITY OF SUCH CRASHES IS ELIMINATED.

PROBLEMS:

1 CONTROL HANDLE SHOULD BE ADJUSTABLE SO THAT IT MAY BE SET FOR NEUTRAL ELEVATOR ON ANY MODEL

2 FLEXIBLE STEEL CABLE HANDLE LEADOUTS ARE ADVISED. BRONZE CABLE, CATGUT, FISHLINE, ETC. WILL BREAK UNDER STRESS.

3 WEAK CONNECTORS ARE DANGEROUS. PULL TEST TO AVOID ACCIDENTS.

4 DO NOT USE THINNER WIRE THAN RECOMMENDED FOR YOUR ENGINE.

5 LINES MUST BE FREE OF KINKS.

6 LINES SHOULD BE CORRECT LENGTH.

7 ALL WIRE CONNECTIONS SHOULD BE SLIP-PROOF, SOLDERLESS, WRAPPED.

8 LINE GUIDE ON WING MUST NOT HIT CONNECTORS, OR CHAFE ON LINES. NO LINE GUIDE IS NEEDED IF LINES RUN THROUGH WING.

9 WIRE CONNECTION AT BELLCRANK MUST NOT SNAP ON FUSELAGE SIDE, OR LIMIT BELLCRANK MOVEMENT.

10 IN LARGE OR HIGH POWERED MODELS, ANCHOR PIVOT BOLT MUST BE MOTOR MOUNTS FOR SAFETY.

11 SOLDER NUT TO PREVENT LOOSENING

12 IF LESS MOVEMENT OF THE ELEVATOR IS DESIRED, DRILLING HINGE HOLES (NEARER PIVOT) IN BELLCRANK

13 USE LARGEST BELLCRANK POSSIBLE

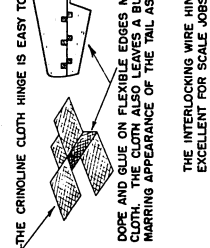
14 FRICTION COUPLED WITH AIR PRESSURE TEND TO "BOW" THE PUSHPROD. IT CAN WEAKEN YOUR MODEL. SUPPORT IT IN CENTER WITH A GUIDE

15 ELEVATOR HORN (AS SHOULD ALL CONNECTIONS) MUST FORM A SNUG FIT WITH PUSHPROD TO PREVENT PLAY.

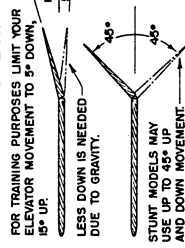
16 CROSS-BAR (CONNECTING ELEVATORS) MUST BE STRONG, WARP RESISTANT. USE HARDWOOD OR PIANO WIRE.

17 HINGES MUST BE RUGGED, FUEL-PROOF, WARP-PROOF, UNAFFECTED BY VIBRATION AND FRICTION-FREE.

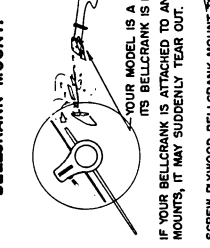
ELEVATOR HINGES:



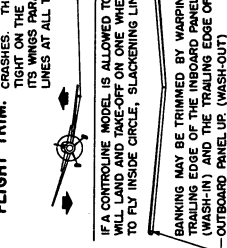
ELEVATOR MOVEMENT:



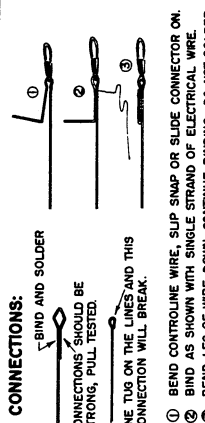
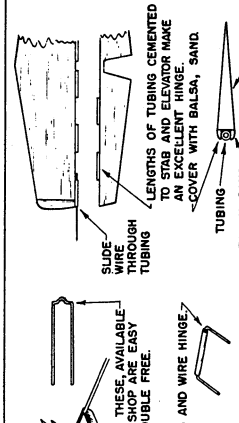
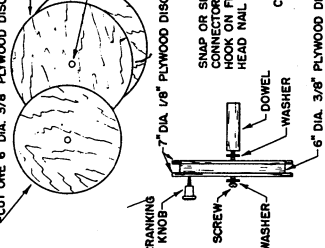
BELLCRANK MOUNT:



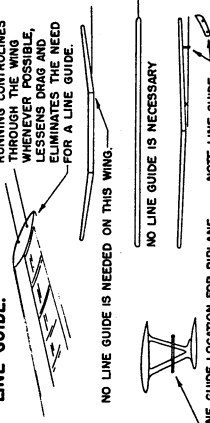
FLIGHT TRIM:



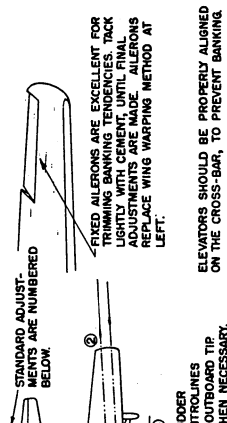
REEL AND LINES:



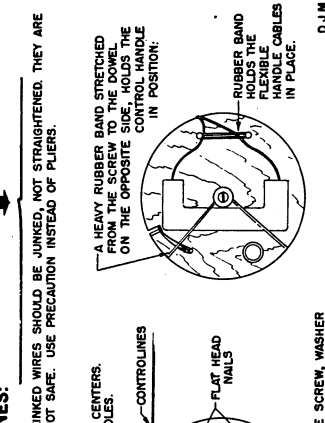
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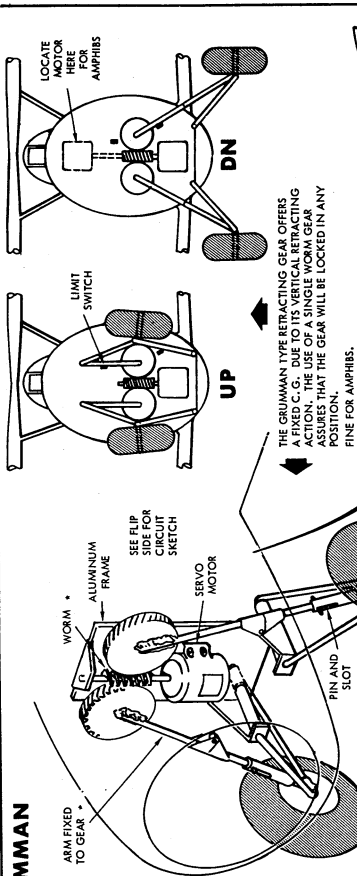
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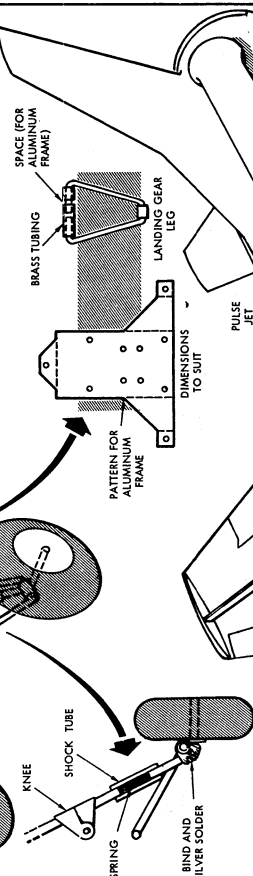
FM DATA SHEETS

RETRACTIBLE LANDING GEAR SYSTEMS

GRUMMAN

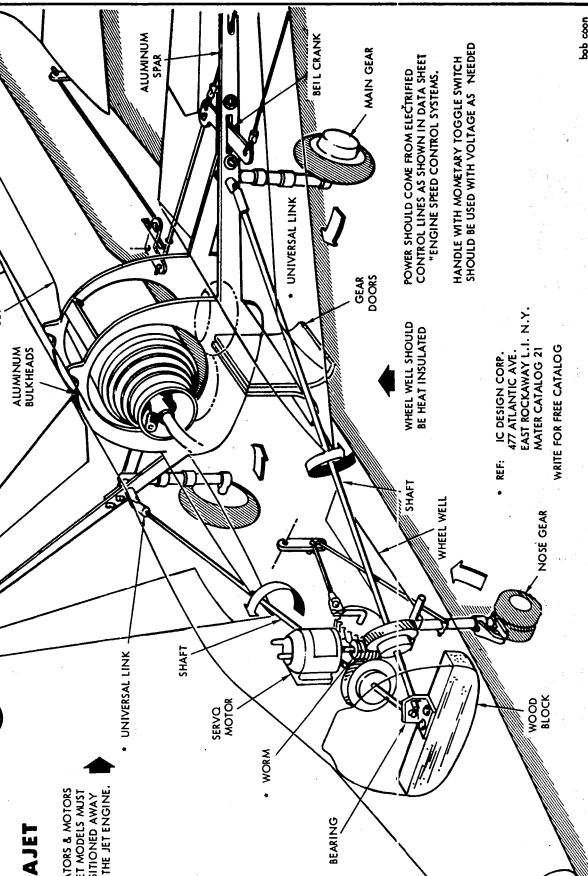


THE GRUMMAN TYPE RETRACTING GEAR OFFERS A FINEST CHOICE OF THE RETRACTING ACTION. THE USE OF A SINGLE WORM GEAR ASSURES THAT THE GEAR WILL BE LOCKED IN ANY POSITION, FINE FOR AMPHIBS.



DYNAJET

ACTUATORS & MOTORS FOR JET MODELS MUST BE POSITIONED AWAY FROM THE JET ENGINE.



POWER SHOULD COME FROM ELECTRIFIED CONTROL LINES AS SHOWN IN DATA SHEET "ENGINE SPEED CONTROL SYSTEMS."

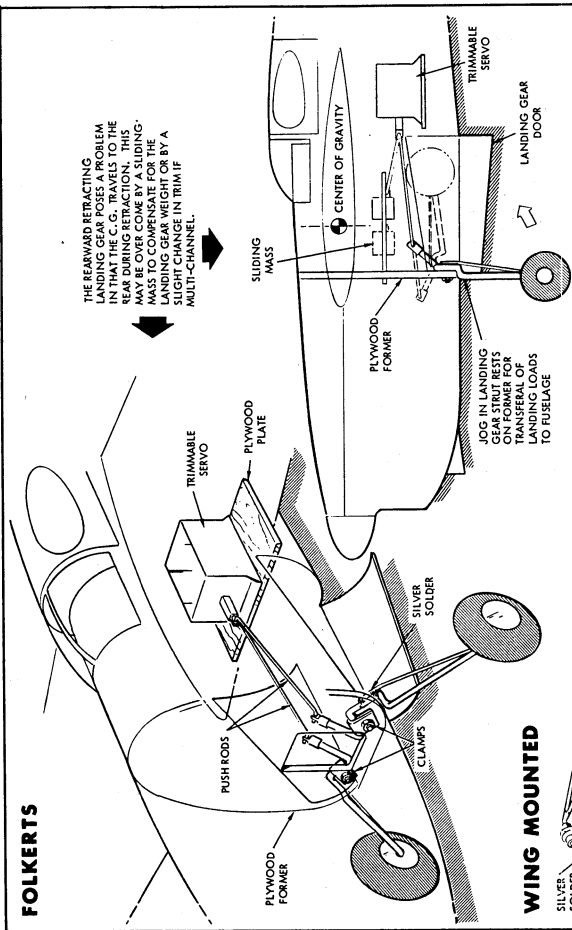
WHEEL WELL SHOULD BE HEAT INSULATED

HANDLE WITH MONETARY TOGGLE SWITCH SHOULD BE USED WITH VOLTAGE AS NEEDED

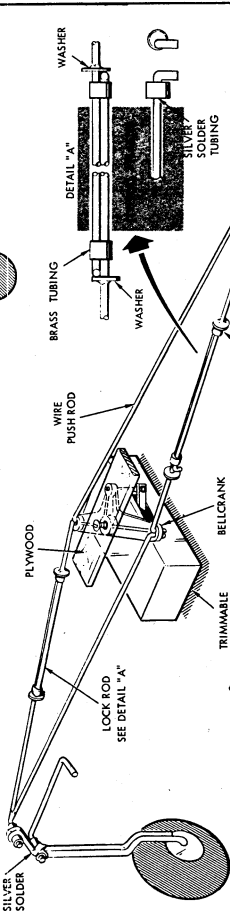
REF: JC DESIGN CORP.
477 ATLANTIC AVE.
EAST ROCKAWAY L.I. N.Y.
WATER CATALOG 21
WRITE FOR FREE CATALOG

bob coon

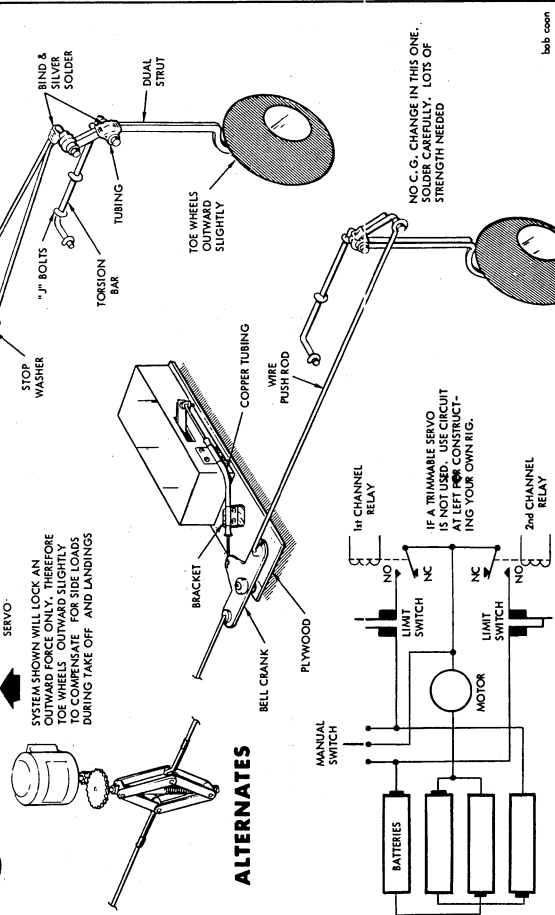
FOLKERTS



WING MOUNTED



ALTERNATES



bob coon

FM DATA SHEETS

LANDING GEARS AND SYSTEMS

BASIC INFORMATION

PIANO WIRE IS THE MOST WIDELY USED MATERIAL FOR LANDING-GEAR STRUTS, AND CONTROL-LINE MODELS. IT CAN BE OBTAINED AT HOBBY SHOPS IN SIZES UP TO 1/8" IN DIAMETER.

DO NOT HEAT

BEND OVER WIRE WHEN BENDING. FRACTURE WILL OCCUR IF WIRE IS HEATED BEFORE BENDING.

WIRE MUST BE CLEAN

AND BRIGHT BEFORE ALLOWING SOLDER TO FLOW THROUGH WRAPPING.

USE FLUX AND ACID CORE SOLDER

AND EVENLY, WITH SOFT WIRE WRAP TIGHTLY.

NO WHEEL

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

POP-UP GEAR

BRASS TUBING. BIND WIRE TO STRUT AND CEMENT WELL.

WIRE STOP

KEEPS GEAR FROM MOVING FORWARD.

WIRE HOOK

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

BRASS TUBING

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

PIANO WIRE

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

TYPE 'A' MOUNTING

"A" BOLTS THROUGH PLYWOOD FIRE-WALL. CAN BE SEWED WITH THIN WIRE AND SOLDERED IF "A" BOLTS ARE NOT AVAILABLE.

TWO-WHEEL LANDING GEAR

THE STANDARD TWO-WHEEL GEAR IS BY FAR THE MOST POPULAR IN USE TODAY. THIS TYPE GEAR MAY BE USED ON ALMOST ALL KINDS OF MODEL PLANES, USING FIRE-WALL OR FORMER CONSTRUCTION. IT CAN BE MOUNTED EITHER BY METHOD "A" OR "B".

TYPE 'B' MOUNTING

HARD Balsa CORE PLYWOOD. CENTER OF SANDWICH IS THE SAME THICKNESS AS THE WIRE USED FOR THE GEAR.

PIANO WIRE

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

WIRE HOOK

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

WIRE STOP

KEEPS GEAR FROM MOVING FORWARD.

BRASS TUBING

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

PIANO WIRE

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

PIANO WIRE

MADE FROM RUBBER-POWERED MODELS. GEAR RETRACTS AS AIRBORNE.

SINGLE-WHEEL GEAR

THIS TYPE IS USED FOR SMALL, LIGHT MODELS. THIS TYPE IS USED WHERE LANDING SHOCKS ARE MORE SEVERE. HEAVIER MODELS AS TWO-WHEEL GEAR.

SHOCK-ABSORBING GEAR

REAR STRUT ROTATES IN TUBING, SECURELY FASTENED TO FORMER. FAIRING MADE FROM SCRAP WOOD AND COATED WITH SILK.

SCALE LANDING GEAR

THIS TYPE OF GEAR IS USED TO MINIMIZE LANDING SHOCK. P.C. MODELS MAY USE A PART OF FORMER.

WING-MOUNTED GEAR

THIS GEAR IS OFTEN RIGIDLY MOUNTED WHEN USED IN SCALE MODELS OF THE WORLD WAR I TYPE.

WHEEL ATTACHMENT

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SHEET-METAL GEAR

WASHER. NUT. PLYWOOD. 24-ST ALUMINUM. 6-32 MACHINE SCREW USED AS AN AXLE.

WING-MOUNTED GEAR

WING CENTER SECTION SHOULD BE REINFORCED TO TAKE LANDING SHOCKS.

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ENGINE NOMENCLATURE

GENERAL LAYOUT

SOME ENGINES FEATURE BOLTED TANK ASSEMBLY; OTHER SEPARATELY MOUNTED.

Labels:

- TYPICAL GLOW PLUG
- CYLINDER HEAD
- CYLINDER
- CONNECTING ROD
- CYLINDER COOLING FINS
- EXHAUST STACK
- PISTON
- RETAINING RING
- FUEL FILLER
- WHRIST PIN.
- AIR VENT
- VENTURI
- METERING JET
- ROTARY VALVE
- CRANKSHAFT
- PROP NUT
- CRANKCASE
- INTEGRAL BEAM MOUNTING LUGS
- COUNTERWEIGHT
- INTEGRAL RADIAL MOUNTING LUGS
- MAIN BEARING
- PROPR DRIVE WASHER
- PROPR FRONT WASHER
- SPLINES
- BALL BEARING
- THRUST BEARING

Callout Box:

- CAN BE INTEGRAL WITH PISTON
- CONNECTING ROD CONNECTS PISTON TO CRANKSHAFT
- OFTEN CALLED PISTON PIN.
- WHRIST PIN ROD CONNECTS TO PISTON

CYLINDERS, HEADS, PLUGS AND PISTONS

MOST PLUGS SCREW ON HEAD

THEY ARE OCCASIONAL INTEGRATED INTO HEAD.

FILAMENT

PISTON RINGS ARE USED ON SOME HIGH-COMPRESSION RACING ENGINES

CYLINDER HEAD OFTEN INTEGRATED WITH CYLINDER

MANY ENGINES HAVE INTEGRAL EXHAUST

CYLINDER SCREWS OFF ON SOME

DOME

DOME SHAPED PISTON

HEAD SCREWS OFF ON SOME

EXHAUST PORTS PERMITS WASTE GASES TO ESCAPE.

BYPASS PORTS PERMITS FUEL TO ENTER FIRING CHAMBER.

PORTS MAY BE ROUND

MANY ENGINES FEATURE A CYLINDER LINER

CYLINDERS VARY CONSIDERABLY IN DESIGN

BAFFLE

BAFFLE TYPE PISTON

CRANKSHAFTS ARE MADE IN A VARIETY OF SHAPES

VENTURI'S, NEEDLE VALVES AND GASKETS

USED IN CONJUNCTION WITH FRONT ROTARY VALVE

FRONT VENTURI

REAR VENTURI

CRANKCASE GASKET OUTLINE

CRANKCASE GASKET

CYLINDER HEAD GASKET

GLOW PLUG GASKET

RATCHET TYPE NEEDLE VALVE ASSEMBLY

FLEXIBLE NEEDLE VALVE

SOME NEEDLE VALVES ARE EQUIPPED WITH A COMPRESSION SPRING FOR POSITIVE SETTINGS.

NEEDLE VALVE ASSEMBLY OUTLINE

USED IN CONJUNCTION WITH DISC ROTORS

SIDE PORT

VENTURI

METERING JET ON NEEDLE VALVES ARE GENERALLY SET HORIZONTALLY.

FOR SINGLE HOLE THEY ARE DOWN OR FACING INTAKE.

FM DATA SHEETS

FUEL TANKS AND SYSTEMS

FREE-FLIGHT

EYEDROPPER TANK

TANK IS FASTENED TO SIDE OF FUSELAGE. COMMERCIAL VERSIONS ARE AVAILABLE.

FUEL LINE TO ENGINE

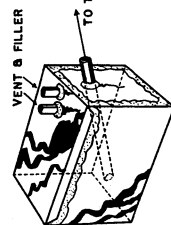
ROD RELEASE
HOLLAND INTERGRAL
TIMER TANK

ENGINE IS STARTED AND ADJUSTED USING FULL TANK CAPACITY. RELEASE OF FUEL LINE, ALLOWING ENGINE RUN FROM LOWER FUEL CELL.

ENGINE RUN FROM LOWER CELL IS ADJUSTED BY ADDING BALSA BLOCKS OR LEAD SHOT.

STANDARD TYPE F-F TANK

AVAILABLE COMMERCIALLY IN MANY SIZES. ALSO HOMEMADE FROM TIN-CAN STOCK



FUEL LINE TANK

CONSISTS OF A COIL OF FUEL LINE, THE LENGTH OF WHICH DETERMINES THE ENGINE RUN. STARTING TANK. PULL OFF FUEL LINE AT LAUNCHING

TIMERS TO LIMIT ENGINE RUNS

TIMER-FUEL SHUT-OFF TYPE

TURNING THE KNOB GIVES A WIDE SELECTION OF ENGINE RUNS, SINCE IT CONTROLS THE AMOUNT OF AIR RELEASED.

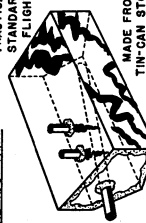
FROM TANK TO ENGINE
FLEXIBLE FUEL LINE
ELMIC TIMER
TRAVEL ROD SQUEEZES THE FUEL LINE SHUTTING OFF THE ENGINE.

CLOCKWORKS TIMER
TIMER ARM ACTUATES D-E TYPE SHUT-OFF

RADIO-CONTROL

TYPICAL R/C TANK

THIS TANK IS PRACTICALLY A STANDARD FREE FLIGHT DESIGN



VEE BOTTOM IS FOR LAST DROP CONSUMPTION

JIM WALKER PRESSURE TANK

RUBBER BANDS APPLY PRESSURE WOOD SLATS DISTRIBUTE PRESSURE EVENLY
FLEXIBLE PLASTIC TANK
TO FILLER CAP
FUEL REGULATOR
TO ENGINE

WALKER TANK ALSO USED IN MANY OTHER CLASSES OF MODELS

A VARIATION OF THE "CLANK TANK" IS ALSO USED IN R/C (SEE STUNT TANKS)

BY HAROLD STEVENSON

CONTROL-LINE STUNT, SPORT & FLYING SCALE

TYPICAL "WEDGE" TANK

THIS IS A TYPICAL WEDGE TANK IN THE STUNT CIRCLES, DESPITE THE FACT THAT IT CUTS WITHOUT WARNING

SQUARE TYPE. ONE OF THE BEST STUNT TANKS IN USE TODAY
PICK-UP IS 1/2 WAY UP
TO ENGINE
OVERFLOW
TO ENGINE

"CLANK TANK"
PICK-UP TUBE SWIVELS FOR NORMAL OR INVERTED FLIGHT.
PICK-UP SWIVELS AT THIS POINT
TO ENGINE
THIS TANK IS ALSO USED FOR AEROBATICS IN RADIO CONTROL F-F MODELS

SPEED

TRUE PRESSURE TANK

AIR PRESSURE IS BLED FROM CRANKCASE THROUGH A #50 HOLE DRILLED IN A 4-40 FLAT HEAD MACHINE SCREW TAPPED IN ENGINE BACKPLATE.

TYPICAL RAM-AIR SPEED TANK

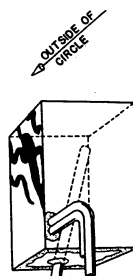
BUILD SPEED TANK TO FIT EACH INDIVIDUAL MODEL
VENT & FILLER
PRESSURE LINE
FILLER & VENT TIGHTLY CAPPED WITH VALVE
PRESSURE JET IS SO LOCATED THAT THE VALVE IS CLOSED BY THE ROTARY VALVE.
TANK SHOULD BE AT LEAST TWICE AS HIGH AS IT IS WIDE
MAKE FROM TIN-CAN STOCK, WELL SOLDERED

PEN-BLADDER PRESSURE TANK
BRASS TUBING PLASTIC FUEL LINE
INK SAC
PENNY BALLOON
BIND WELL
THIS TANK FEEDS FUEL AT A NEAR CONSTANT HIGH PRESSURE UNTIL DRY.
AN ELECTRIC STARTER SHOULD BE USED.

TEAM RACING

TYPICAL TEAM RACER SHUT-OFF SYSTEM

LENGTH X WIDTH X DEPTH MUST NOT BE MORE THAN 1.80 CU. IN.



FILLER SHOULD BE FOR QUICK REFUELING
TRIP WIRE
D-E TYPE SHUT-OFF
TO ENGINE
NO MORE THAN ONE OUNCE OF FUEL IS ALLOWED IN THE ENTIRE FUEL SYSTEM

SECONDARY PUSHROD
BELL CRANK
TO STAB
PIANO WIRE
FROM TANK
TEST SHUT-OFF SYSTEM THOROUGHLY ON THE GROUND BEFORE TEST FLYING.
FULL UP OR DOWN CONTROL ACTUATES SHUT-OFF

NAVY CARRIER EVENT

TWO-SPEED, TWO NEEDLE-VALVE SET-UP

A STANDARD TANK IS USED WITH THE FOLLOWING THAT TWO PICK-UP TUBES ARE EMPLOYED.

TO PICK-UP TUBES
TO BLEED VALVE
BLED VALVE CLOSED: PLANE FLIES SLOW
BLED VALVE OPEN: PLANE FLIES FAST
LOWER NEEDLE VALVE SET LEAN
TO BLEED VALVE

TANK CONSTRUCTION

CURVE SHAPE OF TANK FROM WOOD, SLIGHTLY UNDERSIZE

1

2
WRAP SMOOTHLY WITH TIN CAN STOCK CUT TO WIDTH.

3
1/8" LAP OVER SOLDER WELL WITH BLOCK IN PLACE

4
SLIP OUT BLOCK & INSTALL TUBES

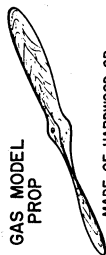
FINISH OFF BY SOLDERING IN THE END PLATES.

BY HAROLD STEVENSON

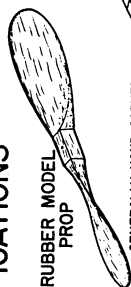
FM DATA SHEETS

PROPELLER INFORMATION

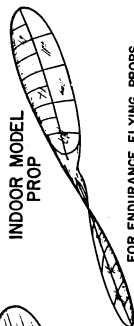
PROPELLER CLASSIFICATIONS



GAS MODEL PROP
MADE OF HARDWOOD OR PLASTIC TO WITHSTAND THE HIGH REVOLUTIONS OF AN ENGINE. AVAILABLE READY FOR USE.



RUBBER MODEL PROP
GENERALLY HAND-CARVED FROM Balsa FOR SPORT FLYING. LIGHTWEIGHT, HARDWOOD OR PLASTIC PROPS ARE AVAILABLE IN FINISHED FORM.

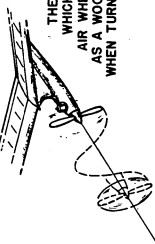


INDOOR MODEL PROP
FOR ENDURANCE FLYING, PROPS ARE ORDINARILY BUILT UP FROM STRIP Balsa AND COVERED WITH MICROFILM. LIGHT-WEIGHT ALL Balsa PROPS ARE GENERALLY USED FOR NOVICE OR SPORT FLYING.

PROPELLER FACTS



THE PURPOSE OF A PROP IS TO CONVERT THE ENERGY OF MOTION INTO FORWARD MOTION (THRUST)



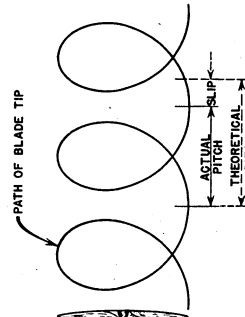
THE PROP IS ACTUALLY AN AIRSCREW WHICH MOVES FORWARD THROUGH THE AIR WHEN ROTATED IN THE SAME MANNER AS A WOOD SCREW MOVES THROUGH WOOD WHEN TURNED WITH A SCREWDRIVER.



DIAMETER IS THE DISTANCE FROM THE TIP TO TIP OF THE PROP.



THE PROP BLADE IS THE SURFACE WHICH PUSHES OR PULLS THE MODEL THROUGH THE AIR. THIS PROP HAS TWO BLADES.



PATH OF BLADE TIP

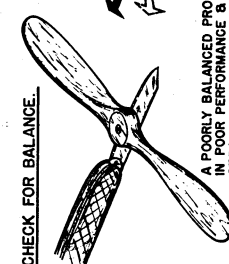


HIGH PITCH PROPS PROVIDE POWER FOR HIGH AIR SPEEDS.



LOW PITCH PROPS PROVIDE POWER FOR LOW AIR SPEEDS.

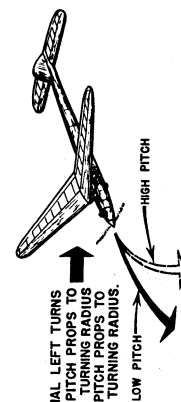
CHECK FOR BALANCE.



A POORLY BALANCED PROP RESULTS IN POOR PERFORMANCE & PUTS A LOT OF POWER UNDER CHECK FOR BALANCE. FIRST, CHECK CENTER & TRIM HEAVY BLADE OR ADD FINISH TO LIGHT BLADE, TO OBTAIN PERFECT BALANCE.



FOR NORMAL RIGHT TURNS USE HIGH PITCH TO INCREASE TURNING RADIUS AND LOW PITCH TO DECREASE TURNING RADIUS.

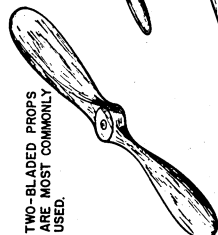


FOR NORMAL LEFT TURNS USE HIGH PITCH PROPS TO DECREASE TURNING RADIUS AND LOW PITCH PROPS TO INCREASE TURNING RADIUS.

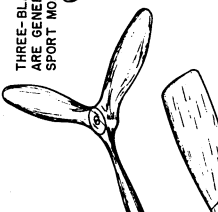
P.D.G.

POPULAR PROPELLER TYPES

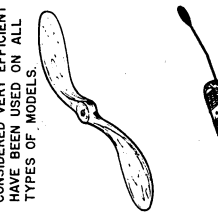
TWO-BLADED PROPS ARE MOST COMMONLY USED.



THREE-BLADED & FOUR-BLADED PROPS ARE GENERALLY USED FOR SCALE OR SPORT MODELS.



SINGLE-BLADE PROPS ARE MOST OFTEN USED FOR ENDURANCE RUBBER-POWERED MODELS, BUT HAVE ALSO BEEN USED SUCCESSFULLY ON GAS MODELS.



PROPELLER MECHANISMS

THE ROTATION OF THE PROPELLER KEEPS THE BLADES EXTENDED BY CENTRIFUGAL FORCE WHILE POWER IS ON. WITH POWER OFF, THE AIR PUSHES THE HINGED BLADES BACK AGAINST THE HUB, REDUCING THE PATH OF LEAST RESISTANCE.

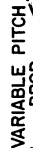
FEATHERING PROP



FREE-WHEELING PROP



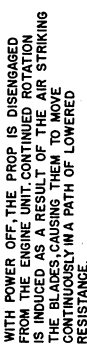
VARIABLE PITCH PROP



WITH POWER ON, THE AIR STRIKING THE BLADES PIVOTS THEM AT THE DESIRED PITCH ON THE HUB LEADING EDGE SO THEY FACE INTO THE PATH OF LEAST RESISTANCE.



WITH POWER OFF, THE PROP IS DISENGAGED FROM THE ENGINE UNIT. CONTINUED ROTATION IS INDUCED AS A RESULT OF THE AIR STRIKING THE BLADES, CAUSING THEM TO MOVE CORROSELY IN A PATH OF LOWERED RESISTANCE.



PROPELLER SELECTION

(RECOMMENDED PROP SIZES, IN INCHES, FOR VARIOUS MODELS)

FREE-FLIGHT GAS			CONTROL-LINE		
LOW PITCH	MED PITCH	HIGH PITCH	LOW PITCH	MED PITCH	HIGH PITCH
5-2	5-3	5-4	4-2	4-3	4-4
6-2	6-3	6-4	5-2	5-3	5-5
7-3	7-4	7-5	6-3	6-4	6-6
8-3	8-4	8-5	7-3	7-5	7-7
9-3	9-4	9-6	8-4	8-6	8-8
10-3	10-5	10-6	9-4	9-7	9-9
11-4	11-5	11-7	10-5	10-7	10-10
12-4	12-6	12-8	11-5	11-8	11-11
13-4	13-6	13-9	12-6	12-9	12-12
14-5	14-7	14-10	13-7	13-10	13-15

LIMITED RUBBER			WAKEFIELD		
LOW PITCH	MED PITCH	HIGH PITCH	LOW PITCH	MED PITCH	HIGH PITCH
7-6	7-9	7-13	13-13	13-19	13-26
8-7	8-10	8-14	14-14	14-20	14-28
9-7	9-11	9-15	15-15	15-21	15-30
10-8	10-12	10-17	16-16	16-22	16-32
11-8	11-13	11-19	17-17	17-23	17-34
12-9	12-14	12-21	18-18	18-25	18-36
13-10	13-15	13-23	19-19	19-27	19-38
14-11	14-17	14-25	20-20	20-29	20-40
15-12	15-19	15-27	21-21	21-31	21-42
16-13	16-21	16-29	22-22	22-32	22-44

INDOOR STICK			INDOOR CABIN		
LOW PITCH	MED PITCH	HIGH PITCH	LOW PITCH	MED PITCH	HIGH PITCH
11-11	11-16	11-22	9-7	9-12	9-17
12-12	12-18	12-24	10-8	10-13	10-18
13-13	13-19	13-26	11-8	11-14	11-19
14-14	14-21	14-28	12-9	12-15	12-20
15-15	15-22	15-30	13-10	13-16	13-22
16-16	16-24	16-32	14-11	14-18	14-24
17-17	17-25	17-34	15-12	15-19	15-26
18-18	18-27	18-36	16-13	16-20	16-28
19-19	19-28	19-38	17-14	17-22	17-30
20-20	20-30	20-40	18-15	18-23	18-32

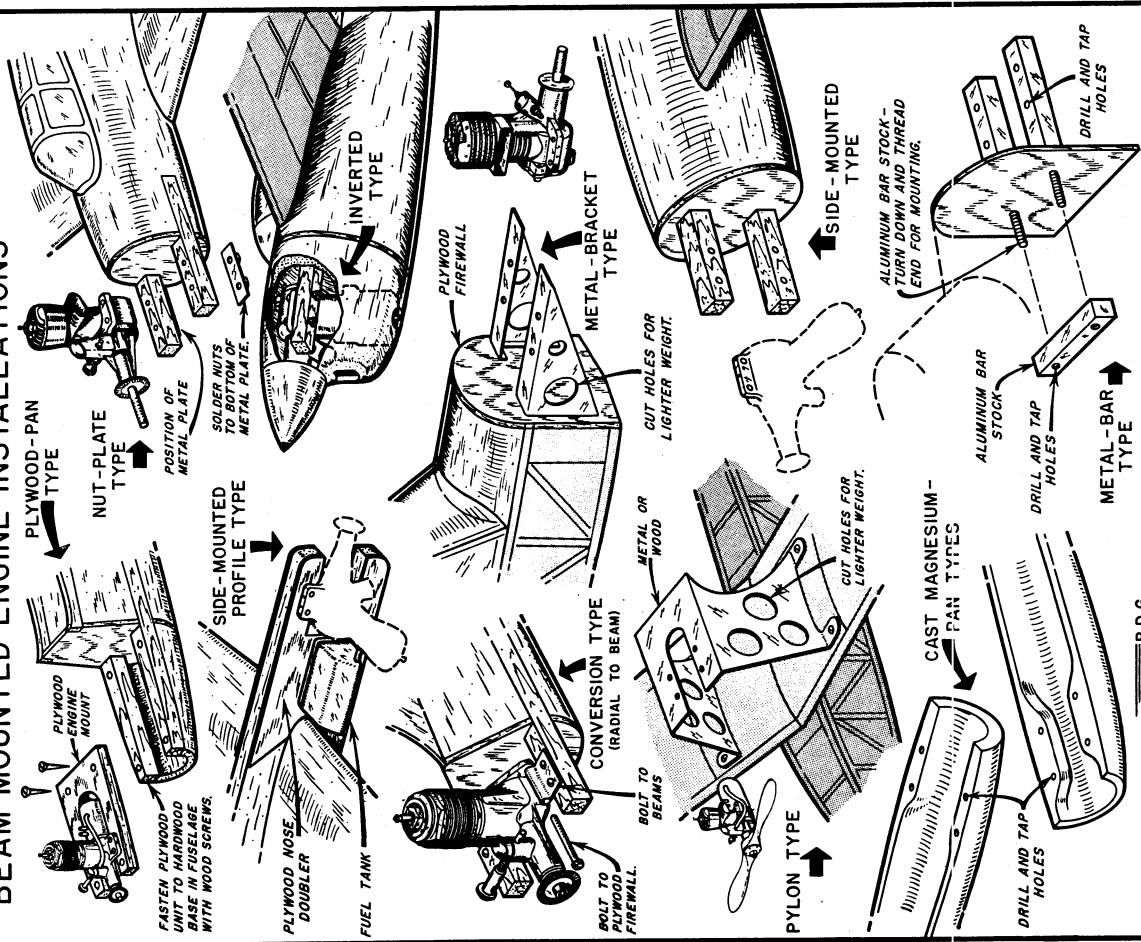
THE PITCH SHOWN IN THESE TABLES IS THE THEORETICAL PITCH.

P.D.G.

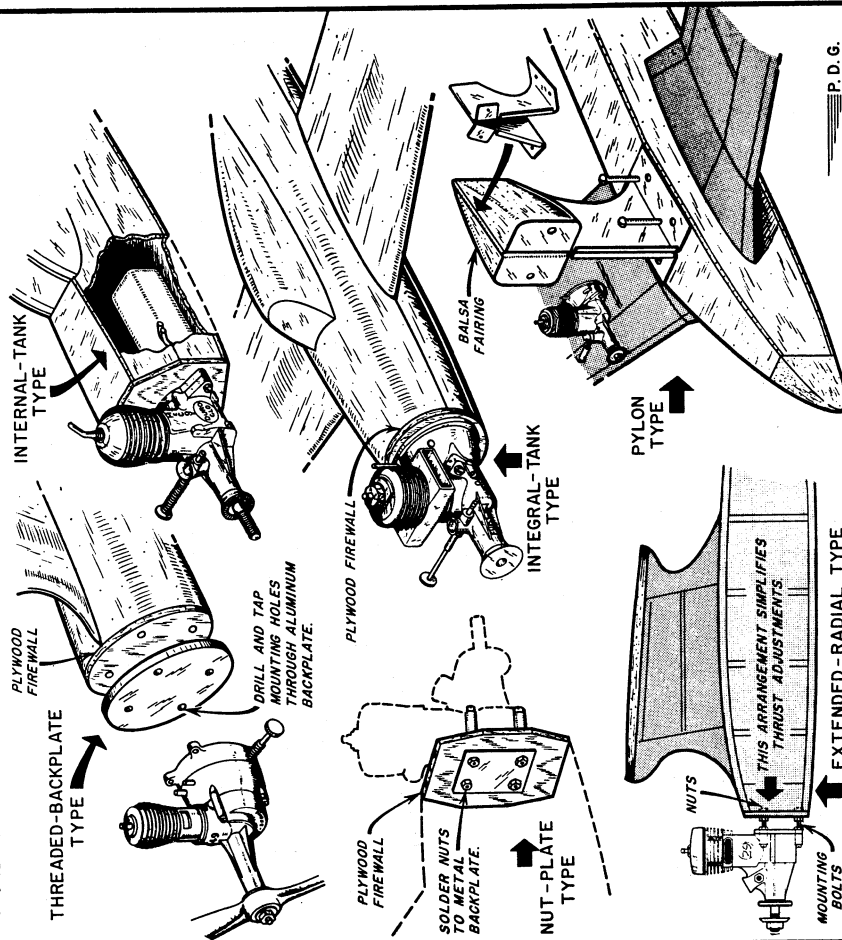
FM DATA SHEETS

ENGINE MOUNTING

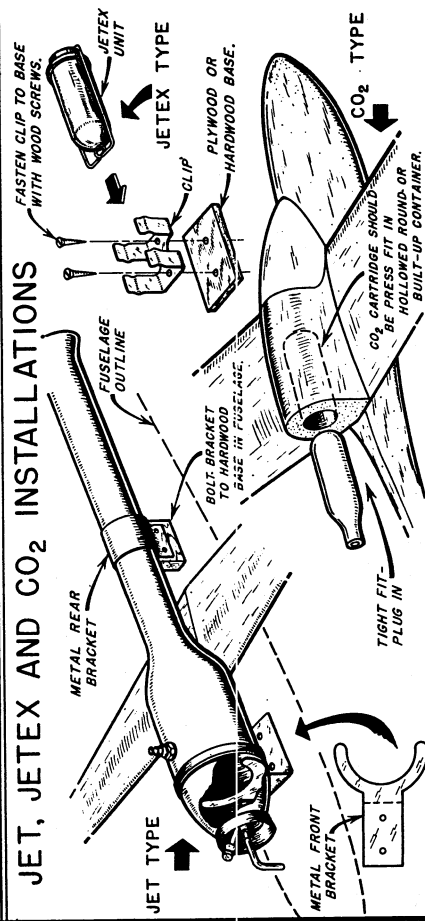
BEAM MOUNTED ENGINE INSTALLATIONS



RADIALLY MOUNTED ENGINE INSTALLATIONS



JET, JETEX AND CO₂ INSTALLATIONS

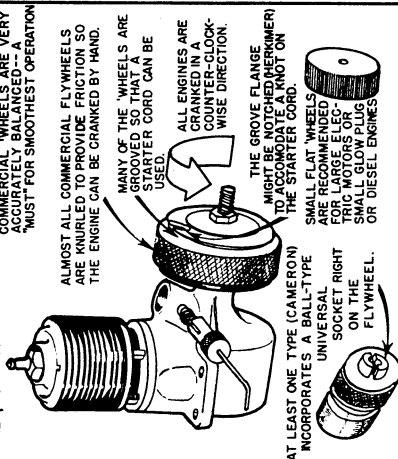


FM MARINE DATA SHEET

INBOARD MARINE INSTALLATIONS

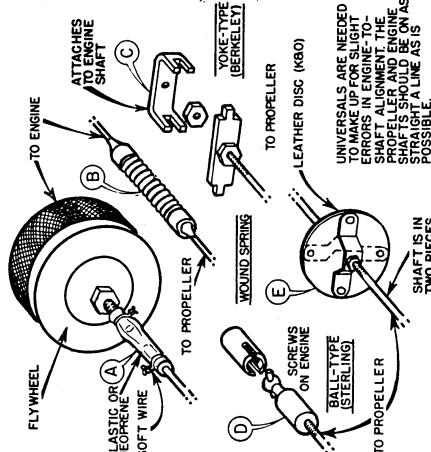
1. FLYWHEELS:

THESE ARE WEIGHTS WHICH ARE NECESSARY TO OVERCOME THE STARTING INERTIA OF THE ENGINE. THEY TEND TO MAINTAIN UNIFORM ROTATION OF THE FLYWHEELS. ALL COMMERCIAL FLYWHEELS MUST BE ACCURATELY BALANCED--A "MUST" FOR SMOOTHEST OPERATION.



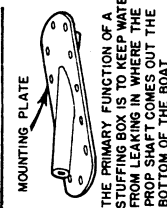
2. UNIVERSALS:

THESE MAY BE PURCHASED, READY TO USE, IN VARIOUS TYPES AND SIZES.



3. STUFFING BOXES:

THE PRIMARY FUNCTION OF A STUFFING BOX IS TO KEEP WATER FROM ENTERING THE ENGINE. THE PROPSHAFT COMES OUT THE BOTTOM OF THE BOX.



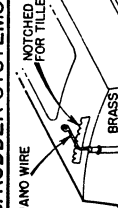
4. REAR STRUTS:

THESE ARE MADE OF METAL OR WOOD. THEY ARE NEEDED TO ELIMINATE SHAFT VIBRATION. THEY ACT AS REAR BEARINGS.



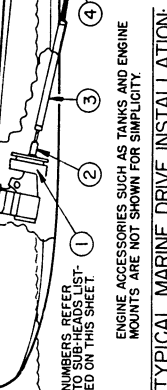
6. RUDDER SYSTEMS:

VARIOUS TYPES OF RUDDER BLADES AND POSTS--SOME ARE PURCHASED, ACTUAL INSTALLATION IS LEFT TO THE USER'S CHOICE.



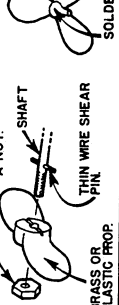
TYPICAL MARINE DRIVE INSTALLATION:

NUMBERS REFER TO SUB-HEADS LISTED ON THIS SHEET.



ARTICULATED RACING DRIVE:

THIS TYPE OF DRIVE IS USED MAINLY ON RACING BOATS. IT IS DESIRABLE TO HAVE THE PROPSHAFT PARALLEL TO THE BOTTOM OF THE HULL.



5. PROPELLERS:

THESE ARE AVAILABLE IN MANY TYPES AND SIZES. THEY ARE MADE OF 2-BLADED AND ARE STAMPED FROM SHEET METAL. 3-BLADED, CAST BRASS OR PLASTIC PROPS ARE ALSO AVAILABLE.



RUNNING A NEW ENGINE

STEP 1

ESSENTIAL EQUIPMENT



STEP 2

BOLT ENGINE TO MOTOR MOUNT AND SECURE TANK FASTEN COMPLETED UNIT TO WORKBENCH WITH C-CLAMP.



STEP 3

ADD PROPELLER RECOMMENDED FOR BREAK-IN PERIOD, AT BEST POSITION FOR FLIPPING.



STEP 4

FILL FUEL TANK AND OPEN NEEDLE VALVE TO RECOMMENDED POSITION FOR STARTING, ACCORDING TO THE MANUFACTURERS INSTRUCTIONS.



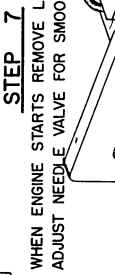
STEP 5

COVER BEFORE FLIPPING PROP CHOKE OR PRIME ENGINE TO ALLOW EXTRA FUEL INTO THE CYLINDER HEAD FOR STARTING.



STEP 7

WHEN ENGINE STARTS REMOVE LEADS. THEN ADJUST NEEDLE VALVE FOR SMOOTH RUNNING.



IF ENGINE REFUSES TO RUN CHECK FOR:

- WEAK BATTERIES. MOMENTARILY CROSS LINES AND CHECK FOR SPARK. PLUGS: REMOVE PLUG AND TEST FOR GLOW WITH LEADS CONNECTED.
- POOR FUEL MIXTURE. ALWAYS USE FRESH CLEAN MIXTURE RECOMMENDED BY MANUFACTURER.
- IMPROPER NEEDLE VALVE SETTING. FUEL MIXTURE EITHER TOO RICH OR TOO LEAN.
- POOR CONNECTIONS. CHECK FOR BROKEN WIRES OR FRAYED STRANDS.

P.D.G.

ENGINE SPEED CONTROL SYSTEMS:

Diagram illustrating the Trigger Control System for a model engine, showing the connection between the engine, trigger control unit, and elevator/horn mechanism.

Labels and Components:

- ELEVATOR**: The control surface being actuated.
- HORN**: The linkage connecting the elevator to the pushrod.
- MULTISTRAND .012 CABLES**: Two cables connecting the trigger control unit to the horn.
- TRIGGER OPERATES MOTOR CONTROL**: The main trigger control unit, featuring a lever and a switch.
- PUSH ROD**: The linkage connecting the trigger control unit to the exhaust slide.
- EXHAUST SLIDE (VARISPEED)**: The engine component that moves up and down to vary engine speed.
- THIRD LINE TO TRIGGER**: A cable connecting the exhaust slide to the trigger control unit.
- TO MOTOR CONTROL**: A cable connecting the trigger control unit to the motor control.
- TO ELEVATOR HORN**: A cable connecting the trigger control unit to the elevator horn.

Textual Information:

- CAN BE USED FOR TAILHOOK BOMB DROP, EJECTION SEAT, RETRACTING GEAR, ETC.**: A note indicating the versatility of the system.
- GIVES GOOD INFINITE SPEED CONTROL WITHOUT USING BATTERIES OR RELAYS, SERVOS, ETC., AND ENGINE SPEED IS CONSTANT AT ALL ENGINE SPEEDS.**: A note describing the benefits of the trigger control system.

GIVES GOOD INFINITE SPEED CONTROL WITHOUT USING BATTERIES OR RELAYS, SERVOS, ETC. LINE TENSION STAYS CONSTANT AT ALL ENGINE SPEEDS.

BATTERY

MOMENTARY TOGGLE SWITCH

**GIVES GOOD INFINITE ENGINE SPEED CONTROL
VIA ELECTRIFIED CONTROL LINES TO SERVO**

CLAPPER RELAY OPERATED

SIZE OF THIS HOLE DETERMINES LOW SPEED R.P.M.'S

2500-5000 OHMS RELAY

BEARING

TORQUE ROD

NYLON BELLCRANK

ROTARY EXHAUST RESTRICTOR

INSULATED WIRES NO. 22

SPEED CONTROL BUTTON: PRESS FOR LOW SPEED

INSULATED LEADS

HANDLE

PLUG

BATTERY CABLE

BATTERY 45V.

RELAY

INSULATED CONTROL LINES

BATTERY

GIVES HIGH AND LOW SPEEDS IN AN ELECTRIC CONTROL LINES AND RELAY

**GIVES HIGH AND LOW SPEEDS
VIA ELECTRIFIED CONTROL LINES
AND RELAY**

CANOPY OPENS;
FLAPS, HOOK SNAP
DOWN WHEN ENGINE
DOWN AT FULL LOW SPEED

OVERCENTER DEVICE

FLAP

USE SERVO HANDLE SHOWN
ON PRECEDING PAGE

TRACK

SERVO

THROTTLE

WIRE SLIDE

STOP

HIGH SPEED CONFIGURATION
FULL THROTTLE,
FLAPS UP, HOOK UP,
CANOPY CLOSED

FLAP

UP

TAIL HOOK

FLAP

SPRING

BEARING

LOW SPEED CONFIGURATION
SERVO HANDLE
FLAPS DOWN, HOOK DOWN,
CANOPY OPEN

MULTI-ENGINE

TO SERVO ON J. ROBERTS FLIGHT CONTROL

DOWN

SHIM BRASS

LANDING LIGHT SWITCH

AT LOW SPEED LANDING LIGHTS FLASH ON

STARBOARD ENGINE

LANDING LIGHT

TO OUTBOARD ENGINE IF DESIRED

"VARISPEED" EXHAUST SLIDE

PORT ENGINE

LANDING LIGHT

BATTERY

EXHAUST

IDLE BAR

PLUG

BY-PASS

INSTALL LOW SPEED PLUG WITH IDLE BAR AS SHOWN FOR BEST LOW SPEED OPERATION. THIS OPERATION - THIS HINDERS QUENCHING

INSTALL LOW SPEED
JUG WITH IDLE BAR
30° TO THRUST LINE
FOR BEST LOW SPEED
OPERATION. THIS
INDICATES QUENCHING

Diagram illustrating the components of a pneumatic control system for a model airplane:

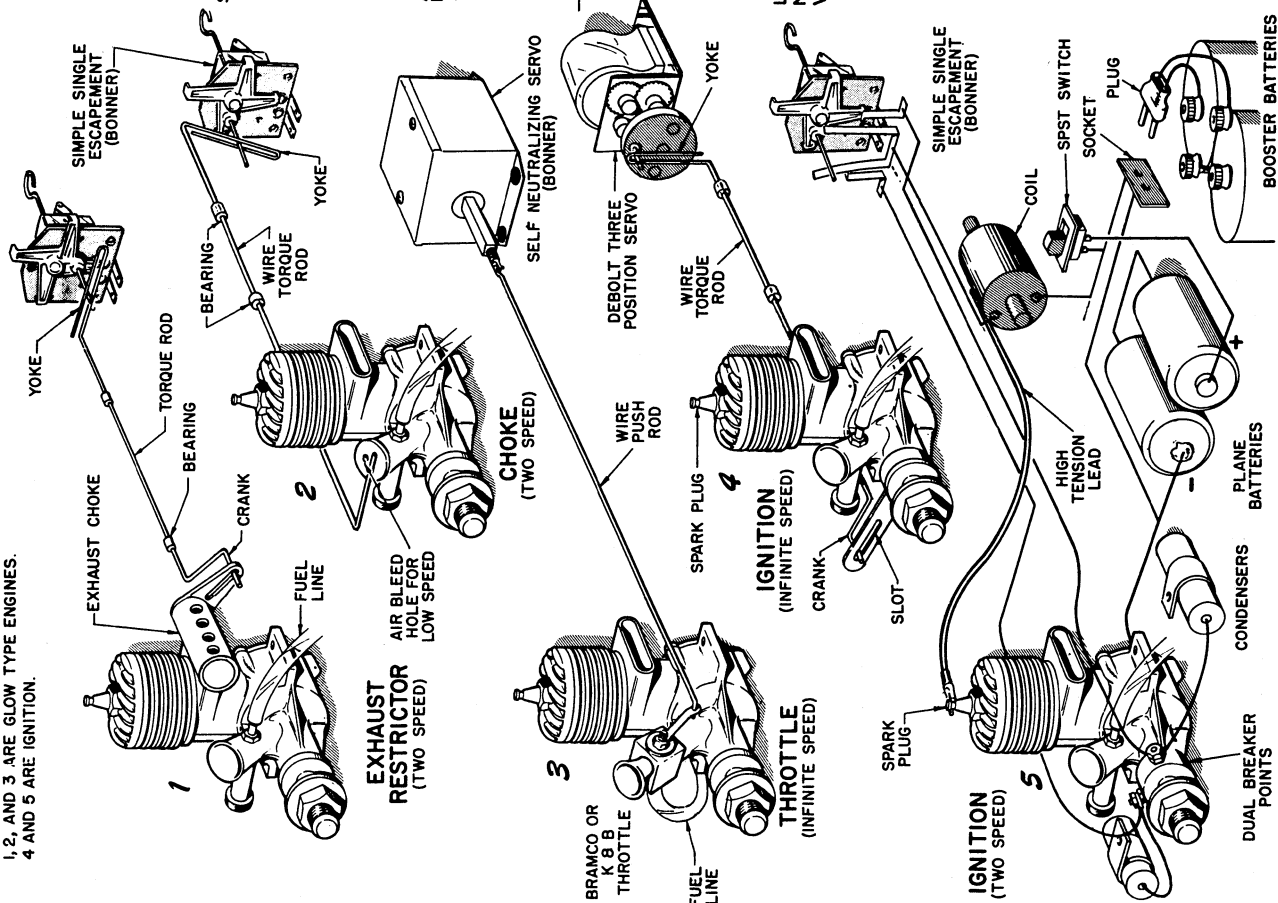
- HANDLE
- RUBBER SQUEEZE BULB ATTACHED TO HANDLE
- CONTROL LINES
- TO BELLCRANK
- TO BELLCRANK
- LIGHT PLASTIC TUBING
- RUBBER BELLOW
- THROTTLE CLAPPER

PNEUMATIC

Bob Coon

ENGINE SPEED CONTROLS

1, 2, AND 3 ARE GLOW TYPE ENGINES.
4 AND 5 ARE IGNITION.

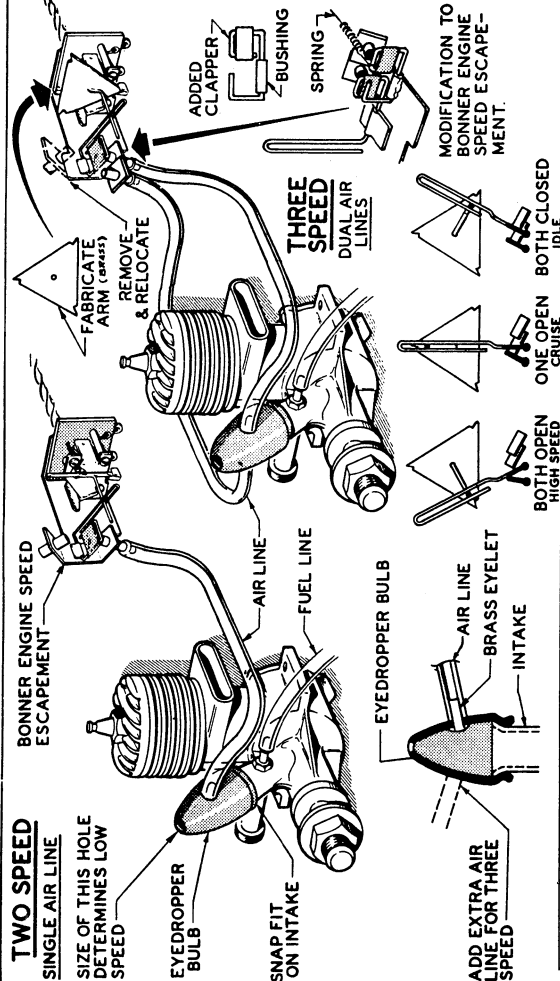


TWO SPEED

SINGLE AIR LINE

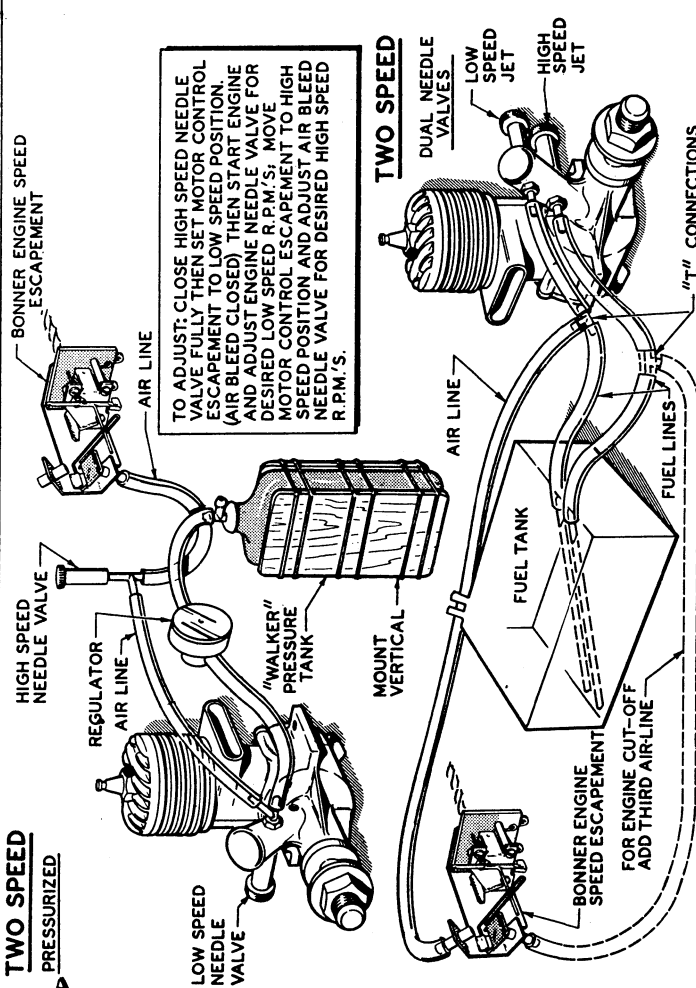
SIZE OF THIS HOLE DETERMINES LOW SPEED

BONNER ENGINE SPEED ESCAPEMENT



ENGINE SPEED CONTROLS

TWO SPEED PRESSURIZED

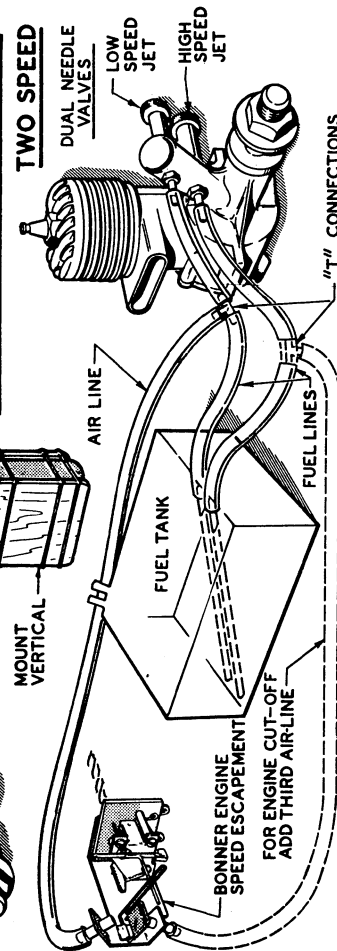


TWO SPEED

DUAL NEEDLE VALVES

LOW SPEED JET

HIGH SPEED JET

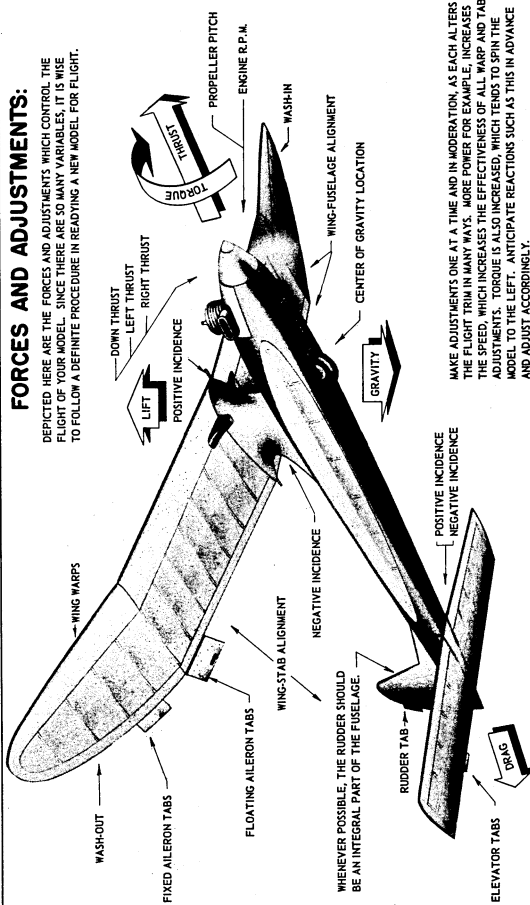


FM DATA SHEETS

ADJUSTING YOUR FREE-FLIGHT MODEL

FORCES AND ADJUSTMENTS:

DEPICTED HERE ARE THE FORCES AND ADJUSTMENTS WHICH CONTROL THE FLIGHT OF YOUR MODEL. SINCE THERE ARE SO MANY VARIABLES, IT IS WISE TO FOLLOW A DEFINITE PROCEDURE IN READING A NEW MODEL FOR FLIGHT.



MAKE ADJUSTMENTS ONE AT A TIME AND IN MODERATION, AS EACH ALTERS THE FLIGHT TRIM IN MANY WAYS. MORE POWER FOR EXAMPLE, INCREASES THE SPEED, WHICH INCREASES THE EFFECTIVENESS OF ALL WING AND TAB ADJUSTMENTS. TORQUE IS ALSO INCREASED, WHICH TENDS TO SPIN THE MODEL TO THE LEFT. ANTICIPATE REACTIONS SUCH AS THIS IN ADVANCE AND ADJUST ACCORDINGLY.

WASH-OUT:

WARPING TRAILING EDGE OF WING TIP UP IS CALLED WASH-OUT. THIS KEEPS TIP FROM STALLING OUT BEFORE THE MAIN PANELS.

5% TO 8% OF CHORD

5% TO 8% OF CHORD

25% TO 50% OF CHORD

C.G. LOCATION:

THE CENTER OF GRAVITY IS USUALLY LOCATED FURTHER BACK ON THE CHORD ON PYLON TYPES.

YOUR MODELS C.G. MAY VARY FROM THE C.G. LOCATION SHOWN ON THE KIT OR MAGAZINE PLANS. DUE TO SLIGHT DIFFERENCES IN WOOD WEIGHT, ENGINE WEIGHT ETC. THIS IS NOT CRITICAL, AND MAY BE ADJUSTED FOR.

FLOTTING AILERON:

SOMETIMES AN ADJUSTMENT IS REQUIRED FOR GLIDE TRIM ONLY. TRY A FREELY HINGED WEIGHTED CELLULOID TAB. IN CLIMB IT WILL HAVE VERY LITTLE EFFECT.

TEST FLY WITH 0° SIDE THRUST UNLESS OTHERWISE ADVISED.

ALIGNMENT:
BOTH WING AND STAB SHOULD BE KEPT TO MAINTAIN ALIGNMENT.

PROP PITCH:
INCREASING PROPELLER PITCH WILL ALSO INCREASE TORQUE. MODEL WILL CIRCLE TIGHTER TO LEFT.

WARP REMOVAL:

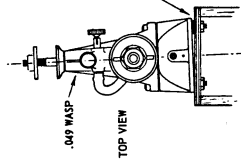
DO NOT NEGLECT THIS!

IF POSSIBLE, ALLOW 24 HOURS FOR WING TO SET BEFORE TEST FLYING. YOUR WING STRUCTURE MUST BE STURDY, OR IT WILL NOT ACT TO HOLD AN ADJUSTMENT.

THE WING OR STAB MAY PURPOSELY BE MISALIGNMENT FOR SPECIAL ADJUSTMENTS. THIS IS NOT FOR BEGINNERS.

THRUST ADJUSTMENTS:

THE THRUST OF THE ENGINE IS OF PRIMARY IMPORTANCE IN CONTROLLING THE FLIGHT UNDER POWER. DOWN THRUST IS USED TO CONTROL LOOPING TENDENCIES, WHILE LEFT AND RIGHT SIDE THRUST CONTROL TURN IN CLIMB.

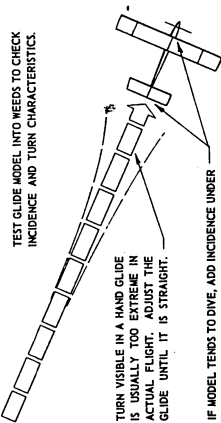


RADIALLY MOUNTED ENGINES MAY BE GIVEN SIDE AND DOWN THRUST WITH WASHERS INSERTED BEHIND CRANKCASE. IF TOO TIGHT TO LEFT UNDER LOW POWER, ADD RIGHT THRUST IN SMALL DEGREES. IT MAY ALSO PROVE NECESSARY TO ADD MORE DOWNTHRUST.

ADDING LEFT OR RIGHT THRUST TO BEAM MOUNTED ENGINES IS MORE DIFFICULT. AT TIMES IT MAY BE POSSIBLE TO MOUNT YOUR ENGINE ON ITS SIDE AND ADD WASHERS ON MOUNTING BOLTS AS PICTURED HERE. SLOWLY ADJUSTING WASHERS WILL ALLOW ADJUSTMENT.

TRIMMING GLIDE:

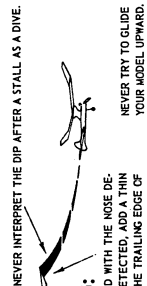
TEST GLIDE MODEL INTO NEEDS TO CHECK INCIDENCE AND TURN CHARACTERISTICS.



STALLING:

TEST GLIDE INTO THE WIND WITH THE NOSE DEPRESSED. IF A STALL IS DETECTED, ADD A THIN SLIVER OF WOOD UNDER THE TRAILING EDGE OF WING OR STAB LEADING EDGE (NEG. INCIDENCE)

WHEN PROPERLY ADJUSTED, YOUR MODEL WILL BE BUOYANT IN GLIDE, FLOATING GENTLY INTO A LANDING WITHOUT ANY TENDENCY TO STALL.



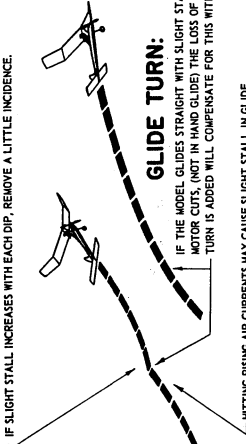
HAND LAUNCH MODEL INTO WIND IN LEVEL ATTITUDE. RUN WITH MODEL AND LET IT FLY OUT OF YOUR HAND.

FIRST POWER FLIGHT:

PLACE PROP ON BACKWARDS AND THROTTLE ENGINE DOWN A CALM DAY AND A 10 SECOND MOTOR RUN IS ADVISED. TEST OVER NEEDS TO PREVENT DAMAGE IF IT SHOULD SPIRAL IN. OBSERVE POWER FLIGHT AND GLIDE FOR FURTHER TRIM.

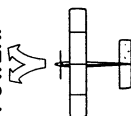
GLIDE TURN:

IF THE MODEL GLIDES STRAIGHT WITH SLIGHT STALL AFTER MOTOR CUTS, (NOT IN HAND GLIDE) THE LOSS OF LIFT WHEN TURN IS ADDED WILL COMPENSATE FOR THIS WITHOUT TRIM.



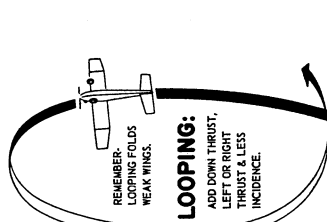
TURN UNDER POWER:

MOST PYLON JOBS CLIMB TO THE RIGHT WHILE SHOULD WING AND CABIN AIRPLANES TRY TO CLIMB TO THE LEFT. ALWAYS REMEMBER THAT INCREASING PROP PITCH OR ENGINE SPEED, WILL TIGHTEN CLIMB TOWARD LEFT. THIS CAN LOOP A PYLON OR SPIN IN A CABIN MODEL.



LOOPING:

ADD DOWN THRUST, LEFT OR RIGHT THRUST & LESS INCIDENCE.



TRANSITION TO GLIDE:

AS THE MODEL CHANGES FROM POWER TO GLIDE, THERE IS OFTEN A SLIGHT STALL BEFORE IT FALLS INTO ITS OPPOSITE GLIDE CIRCLE. SHOULD IT HANG ON THE PROP, THIS STALL MAY BE VERY SEVERE. ADJUST FOR MORE SPRAL IN CLIMB AND TRY TO GET MODEL TO ROLL OUT. TRIM GLIDE FOR MINIMUM LOSS OF ALTITUDE AFTER THE STALL.



DANGEROUS ADJUSTMENTS:

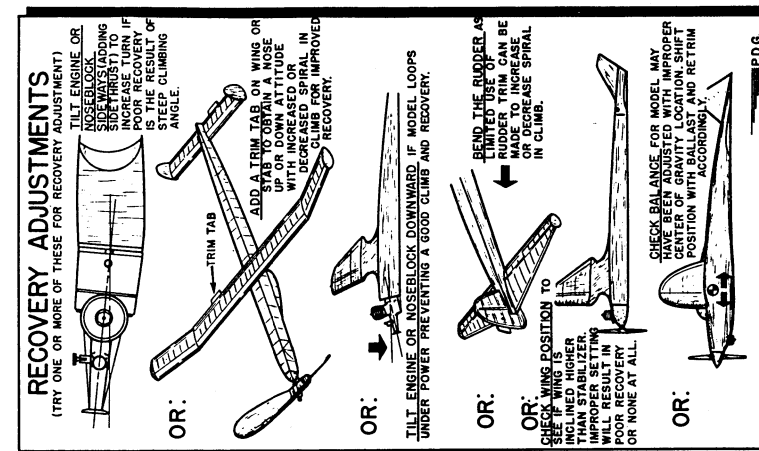
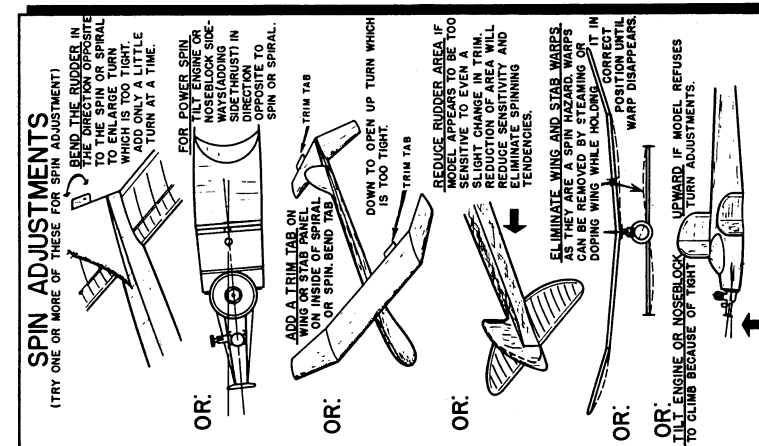
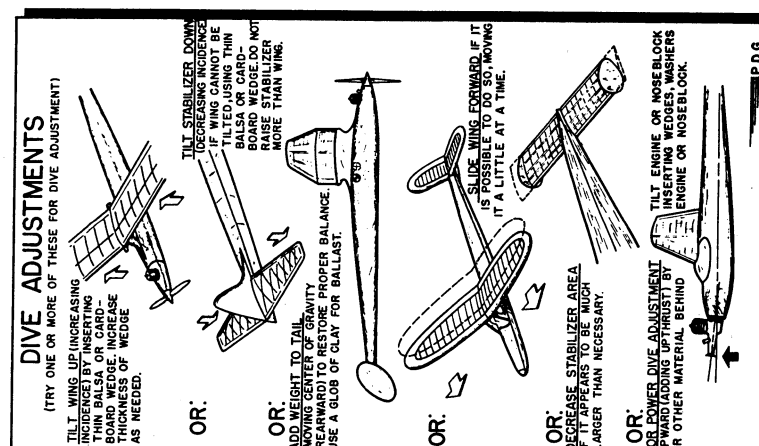
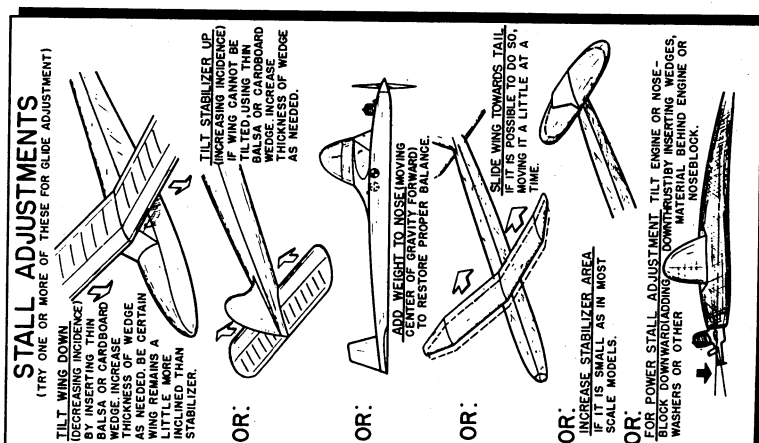
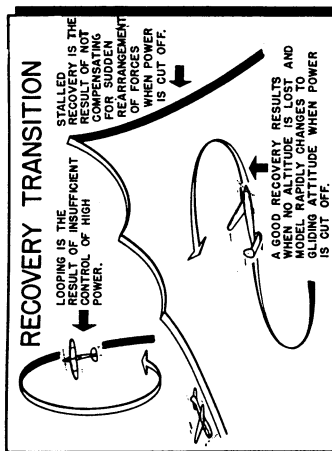
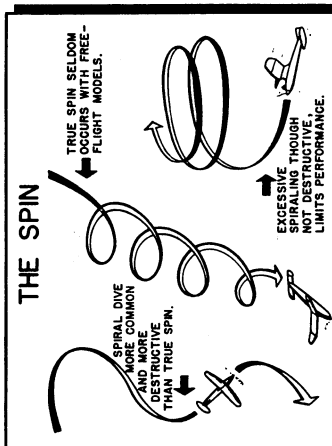
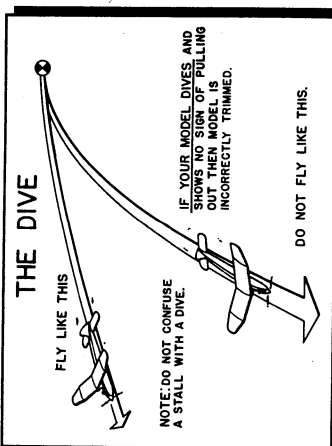
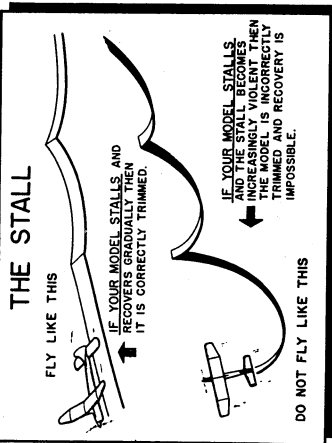
LEFT CLIMB AND GLIDE, OR RIGHT CLIMB AND GLIDE IS A LITTLE RISKY, SO BE CAREFUL. IF MODEL ACCELERATES TOO MUCH UNDER POWER, AND STARTS TO SPIN IN AS MOTOR CUTS, THE GLIDE TRIM WILL NOT ACT TO PULL MODEL OUT, AS WITH AN OPPOSITE CIRCLE.

TROUBLE-SHOOTING FOR BETTER FLIGHTS

• The drawings on these pages illustrate the basic types of improper flight along with some of the solutions which are commonly used. But, remember, correct flight adjustments are difficult to achieve when you have to combat structural or design defects. So, before you start trimming your model for flight, make preflight checks to see that everything has been done according to the plan and the designer's specifications. The power plant you use is a very important factor. If it is larger than that which has been recommended,

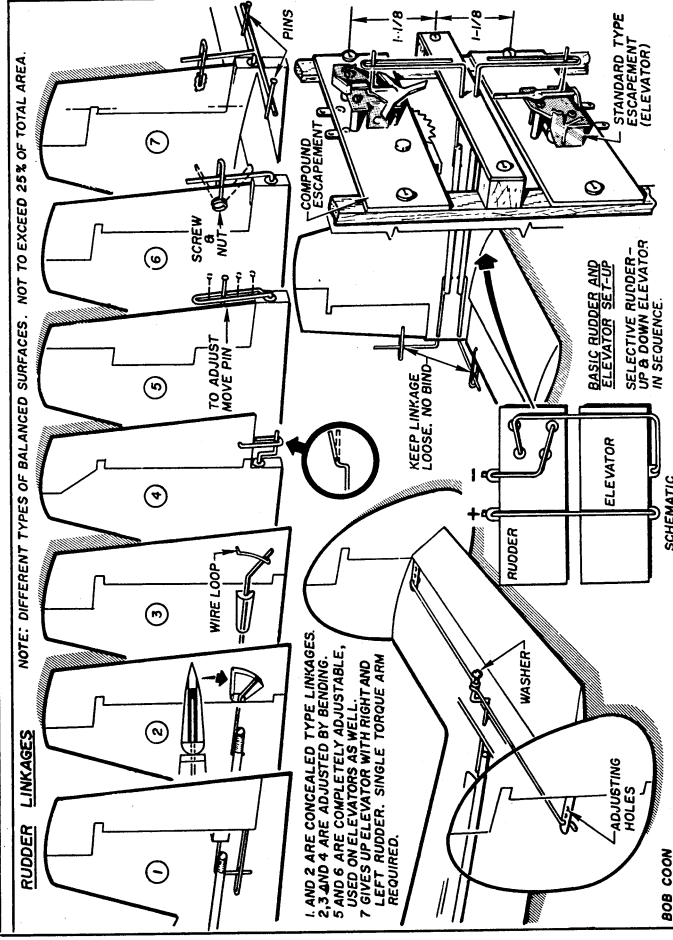
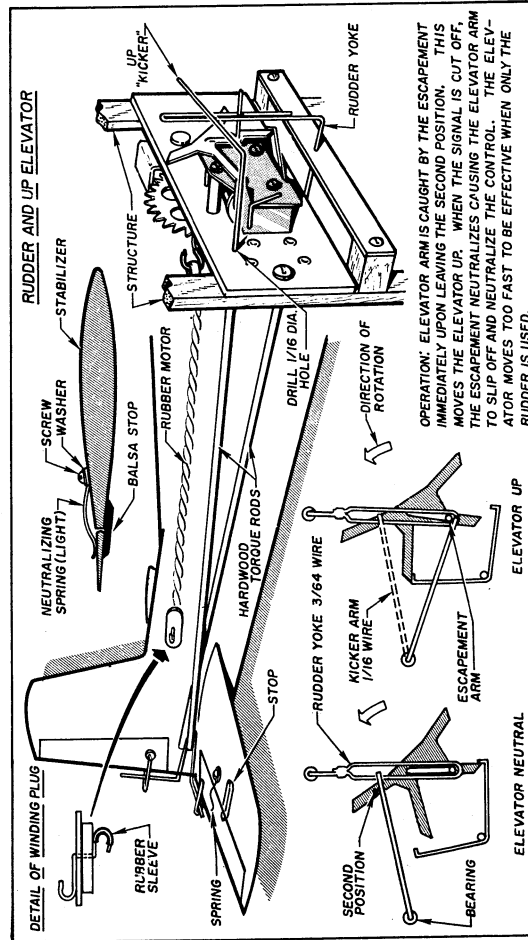
you will have to exert extra caution when adjusting. On the other hand, a smaller power plant gives you more leeway. Top-notch flights will depend on how good the adjustments are for the power that is available for the climb—and the glide trim.

cause of flight variations unless they are keyed into place. Check to see that each unit is correctly aligned with the other units. If flight performance is still erratic, try the suggestions here with:

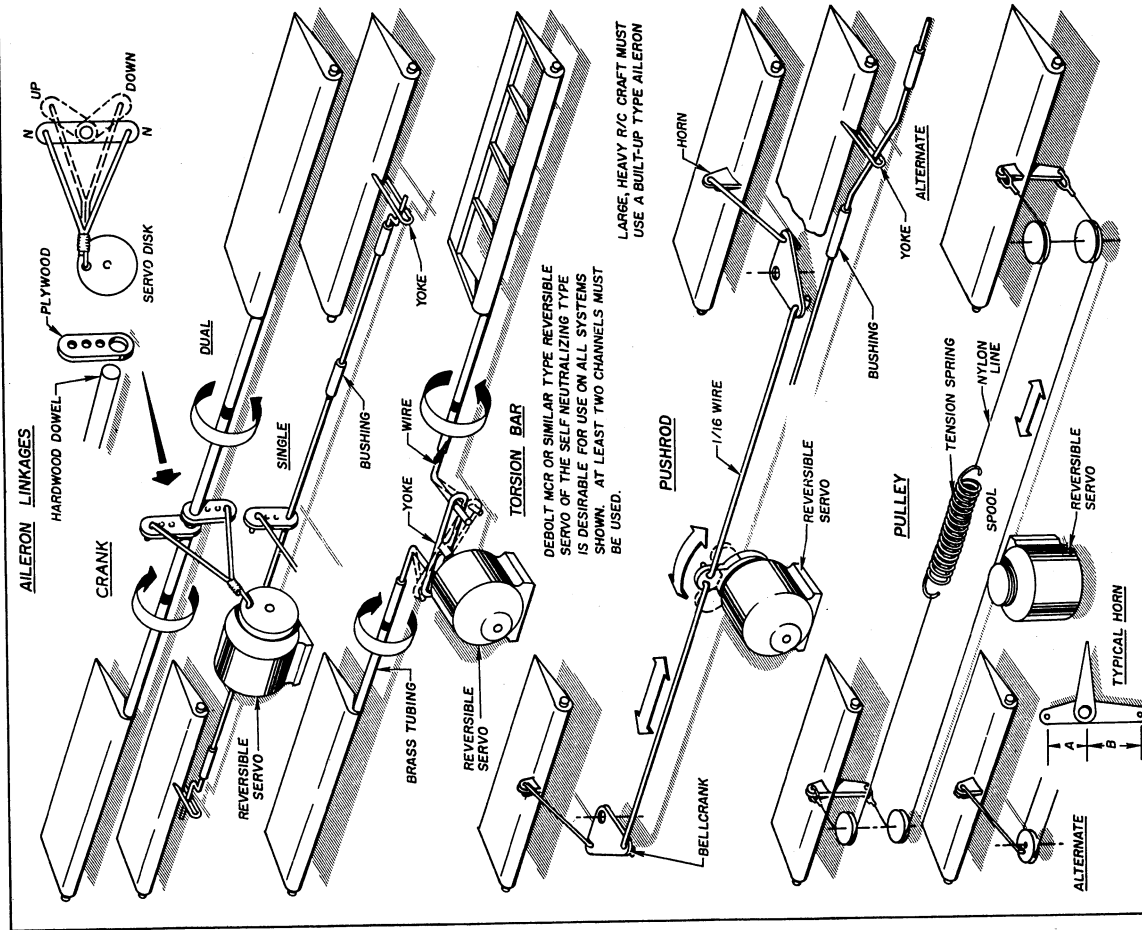


FM DATA SHEETS

R/C CONTROL SYSTEMS



BOB COON



AILERONS MUST BE RIGGED DIFFERENTIALLY. "A" IS SHORTER THAN "B". THEREFORE THE AILERON WILL MOVE UP FURTHER THAN IT MOVES DOWN. EQUAL MOVEMENT CAUSES A YAWING ACTION OPPOSITE TO THE DESIRED TURN. THIS IS CAUSED BY THE MORE PRONOUNCED DRAG OF THE DROOPING AILERON.

SEVEN CHANNELS WOULD BE DESIRABLE TO OPERATE A FULL COMPLEMENT OF CONTROLS, RUDDER, ELEVATOR, AILERON AND ENGINE SPEED. HOWEVER, WITH THE EXISTING FIVE CHANNEL EQUIPMENT A COMPLETE CONTROL SYSTEM CAN BE OBTAINED BY COMBINING THE RUDDER AND ENGINE CONTROLS WITH A COMPOUND ESCAPEMENT.

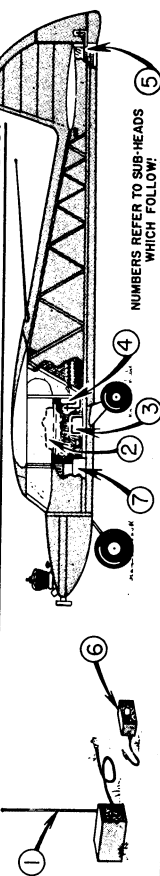
TRY ONE OF THE ABOVE FOR THOSE ADDED POINTS IN "SLOWROLLS", "IMMELMANN'S", MAKE TURNS WITHOUT LOSING ALTITUDE, FLY INVERTED WITHOUT "FALLING OUT" AND MAKE SUPERB "CUBAN EIGHTS".

BOB COON

FM DATA SHEETS

SINGLE-CHANNEL R/C EQUIPMENT

WHAT YOU NEED FOR CONTROLLING MODEL PLANES BY RADIO:



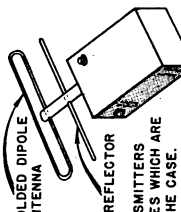
NUMBERS REFER TO SUB-HEADS WHICH FOLLOW:

THESE COME IN SEVERAL TYPES FOR VARIOUS WAVE LENGTHS, AND AT A WIDE RANGE OF PRICES. IF YOU HAVE A "HAM" LICENSE, YOU ARE RESTRICTED TO THE OPERATION OF RADIO CONTROL EQUIPMENT ON THE 485mc AND 27 1/4mc BANDS.

A KEY IS USED TO OPEN AND CLOSE THE CIRCUIT WHICH SENDS THE SIGNAL.

MICRO-SWITCH

GROUND TYPE TRANSMITTER



FOLDED DIPOLE ANTENNA

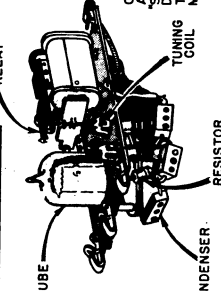
REFLECTOR

THE HAND-HELD TRANSMITTERS OPERATE ON BATTERIES WHICH ARE MOUNTED INSIDE OF THE CASE.

HAND-HELD TYPE TRANSMITTER

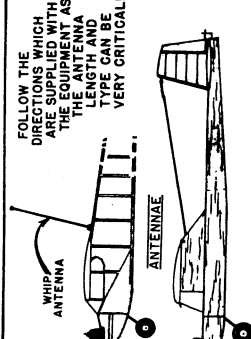
GROUND TYPE TRANSMITTERS ARE MORE VERSATILE SINCE VIBRATOR POWER SUPPLIES, WHICH HOOK UP TO AUTO BATTERIES, CAN BE USED. THIS ELIMINATES CHANGING BATTERIES. POWER UNITS OF THIS TYPE ARE "HOME BUILT". BATTERIES ARE USED IN COMMERCIAL UNITS.

2. RECEIVERS:



THESE COME IN SEVERAL TYPES FOR VARIOUS WAVE LENGTHS, AND AT A WIDE RANGE OF PRICES. IF YOU HAVE A "HAM" LICENSE, YOU ARE RESTRICTED TO THE OPERATION OF RADIO CONTROL EQUIPMENT ON THE 485mc AND 27 1/4mc BANDS.

THE BASIC TYPES ARE THE "HARD TUBE" AND "SOFT TUBE" TYPES. VACUUM TUBES ARE USED IN THE "HARD TUBE" TYPE. THEY ARE FILLED WITH GAS AND ARE CALLED "SOFT". BOTH TYPES WORK WELL. DO NOT USE TYPES OTHER THAN THOSE RECOMMENDED BY THE MANUFACTURER OR DESIGNER!



FOLLOW THE DIRECTIONS WHICH ARE SUPPLIED WITH THE EQUIPMENT. THE ANTENNA LENGTH AND TYPE CAN BE VERY CRITICAL!

3. RELAYS:

THESE COME IN SEVERAL TYPES AND ARE USUALLY PURCHASED AS SEPARATE UNITS. SOME RECEIVERS HAVE THEM BUILT IN.



WHEN BUYING A RELAY, CHOOSE ONE WITH A RESISTANCE VALUE OF ABOUT 8000 OHMS.

THEY ARE ELECTRO-MAGNETIC SWITCHES.

RELAYS ARE USED TO CONTROL THE ACTUATOR CIRCUIT. THEY OPERATE ON THE RECEIVER'S CHANGE IN ELECTRICAL CURRENT VALUE.



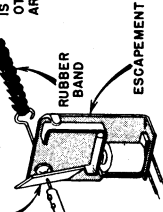
THIS IS A SCHEMATIC SHOWING THE "RELAY TO ACTUATOR" CIRCUIT. SOME UNITS NEED UP TO 6 V. SO CHECK THE SPECIFICATIONS.

4. ACTUATORS:

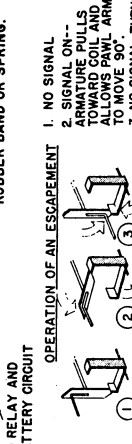
THESE COME IN SEVERAL TYPES AND AT A WIDE RANGE IN PRICE. THOUGH THE SIMPLE ESCAPEMENT IS THE MOST COMMON, THERE ARE MANY OTHERS IN USE. SOME OF THESE ARE:

- (A) COMPOUND ESCAPEMENTS
- (B) PULSE MOTORS
- (C) SERVO MOTORS
- (D) SOLENOIDS

ESCAPEMENTS MOVE THE RELAY COIL WITH POWER DERIVED FROM RUBBER BAND OR SPRING.



TO RELAY AND BATTERY CIRCUIT

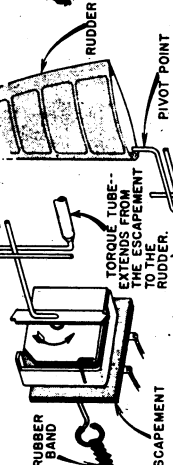


OPERATION OF AN ESCAPEMENT

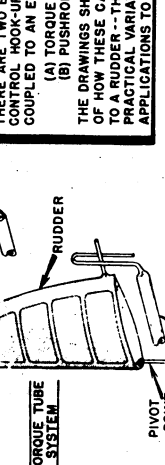
1. NO SIGNAL
2. SIGNAL ON - ANTENNA TOWARD COIL AND ALLOWS PAWL ARM TO MOVE 90°
3. NO SIGNAL - TURNS 90°

5. CONTROLS:

ROTATION OF ESCAPEMENT MOVES THE TORQUE TUBE!



TORQUE TUBE SYSTEM



TORQUE TUBE SYSTEM

PIVOT POINT

TORQUE TUBE

THE MOVEMENT OF THE TORQUE TUBE FROM RIGHT TO LEFT IS APPLIED TO THE CONTROL SURFACE BY ONE OF THE CONTROL LINKAGES SHOWN ABOVE.

TWIN RUDDER SYSTEM

MANY OF THESE PARTS CAN BE PURCHASED

AS THE ESCAPEMENT ARM ROTATES IT TURNS THE BELLCRANK ON THE PIVOT POINT. THIS MOVES THE PUSHROD WHICH IS CONNECTED TO THE RUDDER HORN.

PUSHROD

RUDDER

RUDDER HORN

CONTROL PLATE

AS THE TORQUE TUBE IS ROTATED BY THE ESCAPEMENT, THE CONTROL PLATE MOVES THE PUSHROD WHICH IS CONNECTED TO A RUDDER HORN ON EACH OF THE RUDDERS.

TWIN RUDDER SYSTEM

THESE COME IN VARIOUS TYPES AND SIZES. THE RANGE IN PRICE IS THE HIGHER THE RANGE IN PRICE. THE HIGHER THE RANGE IN PRICE, THE GREATER THE ACCURACY BUT ARE NOT A NECESSITY.

TYPICAL METER VALUES:

TRANSMITTER MILLAMPS - 0-50

RECEIVER MILLAMPS - 0-150

VOLTS - 0-5, 0-100

ALL OF THE METERS LISTED ARE DIRECT CURRENT (D.C.)

THE METERS SHOULD HAVE PLUGS ATTACHED TO THEM SO THAT THEY MAY BE READILY INSERTED INTO, OR REMOVED FROM, THE CIRCUITS WHICH MUST BE CHECKED. FOLLOW THE MANUFACTURER'S OPERATING INSTRUCTIONS AT ALL TIMES!

ACCESSORIES:

SCREWDRIVERS ARE VERY POOR TOOLS FOR TUNING RADIO EQUIPMENT AS THE METAL IN THEM DISTURBS THE CIRCUIT.

WHEN INSTALLING THE R/C EQUIPMENT IN YOUR MODEL YOU WILL NEED SMALL ACCESSORIES SUCH AS:

HOOK-UP WIRE

NUTS AND BOLTS

PLUG SOCKETS

HERE SOME OF THE OTHERS WHICH YOU WILL NEED.

TUNING WAND

SLIDE SWITCH

KEEP A FEW SLIDE SWITCHES ON HAND. RECEIVERS USUALLY REQUIRE THE DOUBLE POLE - SINGLE THROW (DPST) TYPE. A SINGLE POLE - SINGLE THROW PARTS OF MODELS SUCH AS THE ACTUATOR CIRCUIT.

7. BATTERY EQUIPMENT:

THESE COME IN VARIOUS TYPES AND SIZES. IT IS NECESSARY TO CHOOSE THE TYPE WHICH IS BEST SUITED TO THE SIZE OF YOUR MODEL.



"A" BATTERIES

TRANSMITTER: 720, 2F8P, VS003 1.5V

RECEIVER: 736, F3, VS087 4.5V

"B" BATTERIES

TRANSMITTER: N60, 490, VS090 90.0V

RECEIVER: K-45, X445, 487 67.5V

VS006, 477, 487 67.5V

VS006, 485, 738 43.0V

BEARING AND BATTERIES:

504E, 41E, U00E 15.0V

508E, 412E, U08E 22.5V

508E, 430E, U20E 30.0V

THESE ARE RECOMMENDED FOR USE WITH 1/2A R/C MODELS.

THESE CHARTS LIST CODE NUMBERS OF BATTERIES THAT ARE COMMONLY USED WITH R/C EQUIPMENT.

SNAP-ON BATTERY CONNECTORS

1-CELL

2-CELL

4-CELL

BATTERY BOXES ARE A CONVENIENT WAY TO MOUNT SMALL BATTERIES INTO A MODEL. THESE ARE AVAILABLE IN VARIOUS TYPES AND SIZES.

AIRFOIL FUNDAMENTALS

UPPER CAMBER: THE UPPER CURVATURE OF THE AIRFOIL

LOWER CAMBER: THE LOWER CURVATURE OF THE AIRFOIL.

UNDER CAMBER: THE REVERSE CURVATURE OF THE LOWER CAMBER.

DATUM LINE: A REFERENCE LINE ABOVE AND BELOW WHICH THE POINTS FOR THE AIRFOIL CURVE ARE PLOTTED.

AIRFOIL ORIGINATES: EACH AIRFOIL HAS A TABLE OF VALUES WHICH WHEN TRANSFERRED TO THE CORRESPONDING STATIONS ON THE LAYOUT, ABOVE AND BELOW THE DATUM LINE, WILL INDICATE THE POINTS FOR THE AIRFOIL CURVE. THE TOTAL AIRFOIL LENGTH IS CONSIDERED AS 100% WITH THE TABLE OF VALUES DIRECTLY RELATED. EXAMPLE: -123/123% LOCATED BELOW DATUM LINE AT THE SPECIFIED STATION.

CAN

AERONAUTICS

STEP ONE: SELECT AN AIRFOIL LENGTH, TRYING TO USE A SIZE WHICH CAN BE EASILY SUBDIVIDED INTO TEN MAIN STATIONS AND WHERE REQUIRED INTO SUBSTATIONS. EXAMPLE: A $6\frac{1}{2}$ AIRFOIL LENGTH WILL BREAK DOWN INTO TEN MAIN STATIONS $\frac{1}{5}$ APART, ONE PERCENT EQUALLY $\frac{1}{5}\%$.

STEP THREE: LOCATE ALL OTHER STATION POINTS:

STEP FOUR: DRAW GRID LINES PARALLEL TO, ABOVE AND BELOW DATUM LINE AND SPACED APART 1% - 2% OF THE AIRFOIL LENGTH. NOTE: THIS STEP OPTIONAL, BUT ADVISABLE FOR MODELS WITHOUT PREVIOUS BLATTING EXPERIENCE.

STEP TWO: LOCATE TEN MAIN STATION POINTS.

PDFG

FOOTNOTES AND REFERENCES

A diagram of an airfoil cross-section. A horizontal line, labeled "DATUM LINE", runs through the center of the airfoil. The front of the airfoil is labeled "LEADING EDGE" with an arrow pointing to it. The back of the airfoil is labeled "TRAILING EDGE" with an arrow pointing to it. The total length of the airfoil, measured along the datum line from the leading edge to the trailing edge, is labeled "AIRFOIL LENGTH" with a double-headed arrow.

STEP TWO: WITH THE AID OF A TRIANGLE, ERECT A PERPENDICULAR LINE AT THE TRAILING EDGE. 

STEP THREE: DRAW LINE FROM POINT ABOVE DATUM LINE AT THE LEADING EDGE TO THE PERPENDICULAR LINE ERECTED AT THE TRAILING EDGE,

STEP FOUR: PLOT STATION POINTS ON THE DIAGONAL LINE.

SIX POPULAR AIRFOILS

CLARK Y

RECOMMENDED FOR FREE FLIGHT GAS, RUBBER, TOWLINE AND CONTROL CROCK OR BASIC DESIGNS

R.A.F. 32

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER AND
TOWLINE DESIGNS.

N.A.C.A. 6409

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER AND TOWLINE DESIGNS.

P.D.G.

STEP SIX: USING FRENCH CURVES CONNECT THE PLOTTED POINTS TO OBTAIN THE AIRFOIL OUTLINE. SELECT CURVES THAT WILL CONNECT AT LEAST FOUR STATIONS AND BLEND SMOOTHLY WITH PRECEDING CURVE.

STEP FIVE. WITH THE AID OF A TRIANGLE DROP PERPENDICULAR LINES FROM STATION POINTS ON DIAGONAL LINE TO OBTAIN CORRECT POSITIONS OF STATION POINTS ON DESIRED DATUM LINE.

STEP SIX: SPACE GRID LINES 1%-2% APART USING PROCEDURE OUTLINED FOR OBTAINING CORRECT POSITIONS OF STATION POINTS.

STEP SEVEN: USING TABLE OF ORDINATES LOCATE VALUES FOR UPPER AND LOWER GAMBER AT DESIGNATED STATIONS. NOTE: HORIZONTAL GRID LINES REMOVED FOR CLARITY.

STEP EIGHT: USING FRENCH CURVES CONNECT THE PLOTTED POINTS TO OBTAIN THE AIRFOIL OUTLINE. 100

GRANT X-8

DAVIS

**RECOMMENDED FOR SPORT, BASIC AND CONTEST FREE FLIGHT GAS,
RUBBER, TOWLINE AND FOR U-CONTROL SPORT AND SPEED DESIGNS.**

N A C A 2409

RECOMMENDED FOR U-CONTROL SPORT AND SPEED DESIGNS.

